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FEDERAL AID IN FISH RESTORATION
1998 JOB PERFORMANCE REPORT
PROGRAM F-71-R-23

REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS
McCALL REGION (Subprojects I-B, II-B, III-B)

PROJECT I.	SURVEYS AND INVENTORIES
Job a.	McCall Subregion Mountain Lakes Investigations
Job b[1].	McCall Subregion Lowland Lakes Investigations
Job b[2].	Cascade Reservoir, Yellow Perch Investigations
Job c.	McCall Subregion Rivers and Streams Investigations
Job d.	McCall Subregion Salmon and Steelhead Investigations
PROJECT II.	TECHNICAL GUIDANCE
PROJECT III.	HABITAT MANAGEMENT

By
Donald Anderson, Regional Fishery Manager
Paul Janssen, Regional Fishery Biologist
Kim Apperson, Regional Fishery Biologist
Laurie Hostettler, Fisheries Biologist Aide

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1998 ANNUAL PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management

Project I: Surveys and Inventories

Subproject: Southwest Region (McCall)

Job: a

Title: Mountain Lakes Investigations

Contract Period: July 1, 1998 to June 30, 1999

ABSTRACT

Standard mountain lake surveys were completed on four mountain lakes, three of which contained fish. Large viable populations of both bull trout *Salvelinus confluentus* and rainbow trout *Oncorhynchus mykiss* were found in Riordan Lake. We found westslope cutthroat trout *O. clarki lewisi* in Chilcoot Lake and rainbow trout in Black Lake. Winifred Lake was dry.

A brook trout *Salvelinus fontinalis* eradication project was implemented on Kimberly Lake #2.

Authors:

Paul Janssen
Regional Fishery Biologist

Lauri Hostettler
Fisheries Biologist Aide

OBJECTIVES

1. Evaluate fisheries management strategies in alpine lakes.

2. Identify problems and/or opportunities in lakes that currently are not being directly managed.

INTRODUCTION

Standard Mountain Lake Surveys

The Idaho Department of Fish and Game (IDFG) conducts standard mountain lake surveys each year to evaluate and adjust the mountain lakes fish-stocking program. We completed surveys on four lakes in 1999.

Kimberly Lake # 2

Kimberly Lake # 2 lies in the Bear Creek drainage, which flows directly into the Salmon River. A standard lake survey in 1996 revealed that this lake contained brook trout *Salvelinus fontinalis* (Janssen et al. 2000). Discussions with local residents indicated that the appearance of brook trout in Kimberly Lake #2 was a recent event and that this lake had historically contained rainbow trout *Oncorhynchus mykiss* prior to brook trout. This lake is connected to Bear Creek by a small outlet which runs through the spring and early summer months. A standard stream survey was completed on Bear Creek in 1996 (Janssen et al. 2000) which revealed a small population of wild rainbow trout. No other fish were collected. We felt that the presence of brook trout in Kimberly Lake #2 presented a serious threat of introduction and establishment of a viable brook trout population into Bear Creek. Therefore, we removed brook trout from this lake in 1998 to reduce this threat.

METHODS

Standard Mountain Lake Surveys

Idaho Department of Fish and Game (IDFG) personnel completed standard surveys on four mountain lakes in 1998, including Riordan Lake (07-454), Black Lake (07-455), Chilcoot Lake (07-457), and Winifred Lake (05-144). We examined fish populations and habitats in each lake using the IDFG standard mountain lakes survey methods. We set gill nets (125-ft diving) in the afternoon and pulled them the next morning. All fish collected were weighed to the nearest gram and total length measured to the nearest millimeter.

Kimberly Lake # 2

We used standard 150-foot experimental gill nets to remove brook trout from Kimberly Lake #2. We set six nets, three floating and three diving, for two nights. Nets were then pulled, fish were removed, and the nets were reset. We checked and removed all fish again after another four and nine consecutive nights. We then removed two of the floating nets and left the remaining four nets another nine nights. Nets were fished a total of 126 net nights. We weighed and measured total length of all fish collected.

RESULTS

Standard Mountain Lake Surveys

We collected fish from three of the four lakes surveyed. We collected 51 rainbow trout from Black Lake (Table 1) which was on a three year stocking rotation of rainbow trout. Condition factors (Ktl) averaged around 0.90 (Table 1). One possible westslope cutthroat trout *O. clarki lewisi* x rainbow trout hybrid was also collected.

Angling efforts revealed Chilcoot Lake to have a westslope cutthroat trout population although it was stocked on a three-year rotation with rainbow trout. No rainbow trout were caught or observed.

We found very large, viable populations of both rainbow trout and bull trout *S. confluentus* and one cutthroat in Riordan Lake (Table 1). The Lake was on a three year stocking rotation of westslope cutthroat trout. The last recorded stocking of rainbow trout was 930 in 1940. Lake trout *S. namaycush* were introduced into Riordan Lake in 1933 (Lafe Cox, personal communication), but we caught none during this survey.

We found Winifred Lake totally dry. It appeared to be watered only after spring runoff.

Habitat data for each of the above lakes are presented in the appendices.

Kimberly Lake # 2

We removed 94 brook trout from Kimberly Lake # 2, 51 in the first two days (September 15 through September 17, 1998). We removed 13 fish after each of the next four (September 17 through September 21, 1998) and nine (September 21 through September 30, 1998) days. The final nine days (September 30 through October 10, 1998) resulted in the removal of another 15 fish. Numbers and relative weights (Wr) by length groups are given in Table 1. We restocked the lake with westslope cutthroat trout fry in October 1998.

Table 1. Total number and average condition factors (Ktl) or relative weights (Wr) by length group of each species of fish sampled in mountain lakes 1998.

Lake	Catalog Number	Species Ktl/Wr	Total Length (inches)														
			4	5	6	7	8	9	10	11	12	13	14	15	16	17	17+
Riordan	07-454	Bull				27	38	14	1								
		Ktl				0.78	0.77	0.84	0.69								
		Rainbow	21	20	9	25	19	6	3								
		Ktl	0.76	0.79	0.92	0.88	0.83	0.82	0.76								
		Cutthroat										1					
		Ktl										0.87					
		Cutt X					1	2									
		Ktl					0.87	0.94									
Chilcoot	07-457	Cutthroat	1 hour angling, no nets					2		1							
		Ktl						0.93									
Black	07-455	Rainbow	2		2	1	7	7	9	3							
		Ktl	0.27		0.92	0.85	0.96	0.92	0.84	0.76							
Kimberly #2	07-244	Brook					5	2	2	3	13	5	9	9	2	1	
		Wr					91	103	97	96	90	95	86	78	74	59	
Winifred	05-144	No Fish	Dry Lake														

RECOMMENDATIONS

1. Discontinue stocking Riordan Lake (07-454) with westslope cutthroat trout.

2. Switch rainbow trout stocked in Black Lake (07-455) to 750 westslope cutthroat trout.

3. Continue to monitor fish populations in high mountain lakes in the region and make appropriate management changes.

4. Continue working with Payette National Forest personnel in collecting baseline fisheries and habitat data in high mountain lakes.

LITERATURE CITED

Janssen, P., K. Apperson, and D. Anderson. 2000. Regional fishery management investigations. 1996 Job Performance Report, Project F-71-R-21. Idaho Department of Fish and Game, Boise.

1998 ANNUAL PERFORMANCE REPORT

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Contract Period: July 1, 1998 to June 30, 1999

ABSTRACT

Midwater trawling on Payette Lake revealed a population estimate of 461,034, +/- 47% (95% CI) and 59,481, +/-78%, age 0+ and 1+ kokanee *Oncorhynchus nerka kennerlyi*, respectively.

Little Payette Lake was gillnetted in October to monitor relative numbers and biomass of fish species present. Trout species made up 8.7% and 8.8% of the catch by total number and total weight. Northern pikeminnow *Ptychocheilus oregonensis* and largescale suckers *Catostomus macrocheilus* combined made up 84.4% of the total catch by number and 70% by weight.

Counts of fishing boats and shore anglers on Cascade Reservoir made on Memorial Day, July 4th, and Labor Day and averaged 58 and 39.5, respectively.

We completed standard lowland lake surveys on Oxbow, Hells Canyon, Brundage and Lost Valley reservoirs. We found smallmouth bass *Micropterus dolomieu* and channel catfish *Ictalurus punctatus* to be the most abundant fish in Oxbow Reservoir and smallmouth bass and white crappie *Pomoxis annularis* the most abundant in Hells Canyon Reservoir. We collected rainbow trout *O. mykiss* and westslope cutthroat trout *O. clarki lewisi* from Brundage Reservoir, and yellow perch *Perca flavescens*, rainbow trout, splake *Salvelinus fontinalis x Salvelinus namaycush*, cutthroat trout and brook trout *Salvelinus fontinalis* from Lost Valley Reservoir.

A Memorial Day weekend creel census on May 23-24, 1998 on Horsethief Reservoir revealed that 3,932 angler hours were spent to catch 2,182 fish.

Population estimate work on Fish Lake revealed 877, +/-93 westslope cutthroat trout present.

Authors:

Paul Janssen
Regional Fishery Biologist

Kim Apperson
Regional Fishery Biologist

Don Anderson
Regional Fishery Manager

OBJECTIVES

To conduct investigations in lowland lakes and reservoirs to enhance, maintain and protect McCall area fisheries.

INTRODUCTION

Payette Lake

Payette Lake was previously described by Grunder et al. (1990). We conducted the annual kokanee *Oncorhynchus nerka kennerlyi* age class population estimate in 1998.

Little Payette Lake

The quality rainbow trout *O. mykiss* fishery in Little Payette Lake has been threatened in recent years by an increasing populations of northern pikeminnow *Ptychocheilus oregonensis* and largescale suckers *Catostomus macrocheilus* (Janssen and Anderson 1992, 1994a, 1994b, 1997). We surveyed the fish population again in 1998 to monitor trout growth, condition, and relative abundance of fish populations.

Cascade Reservoir Angler Counts

Angler counts were made on Memorial Day, July 4th and Labor Day to compare relative angling pressure with past survey years.

Lowland Lake Surveys

Fish populations in Brundage and Lost Valley reservoirs were surveyed to determine effectiveness of current fish management strategies.

Horsethief Reservoir

A Memorial Day weekend creel survey was conducted on Saturday and Sunday to continue our annual angler use trend work.

Oxbow and Hells Canyon Reservoirs

An Idaho Department of Fish and Game (IDFG) standard lowland lake survey was performed on Hells Canyon and Oxbow reservoirs in 1998.

Fish Lake

Fish Lake is the Department's westslope cutthroat trout *Oncorhynchus clarki lewisi* broodstock lake. Wild and stocked hatchery fingerlings grow and mature in the lake and ascend up Fish Lake Creek to spawn. The Department's McCall Fish Hatchery personnel operate a fish weir and holding facility in Fish Creek to capture and spawn these fish. The resulting eggs are taken to the hatchery where they are hatched, raised and stocked as fry/small fingerling into high mountain lakes across the state. Numbers of spawning cutthroat in the past several years have not been adequate to meet the mountain lakes stocking requests. Therefore we completed a population estimate on Fish Lake to determine future spawning potential and needs for management changes for the lake.

METHODS

Payette Lake

Biologists sampled kokanee in Payette Lake with a midwater trawl, for the tenth consecutive year, on August 24, 1998. Bowles et al. (1986, 1987) and Grunder et al. (1991) reported methodology for the trawling technique.

Little Payette Lake

We set four, standard lake survey, diving gill nets in Little Payette Lake on October 20, 1998. We connected two of the diving nets end-to-end to fish a longer, deeper section of bottom contour. We fished two locations with the four nets. The nets were set on the afternoon of October 20 1998, fished all night and pulled the next morning. All trout, tiger muskie *Esox lucius x E. Masquinongy* and smallmouth bass *Micropterus dolomieu* collected were measured to the nearest mm and weighed to the nearest 5 grams. All suckers and northern pikeminnow collected were counted and a total weight taken. We examined all trout collected for fin clips.

Cascade Reservoir Angler Counts

We completed angler counts on Memorial Day, July 4th, and Labor Day on Cascade Reservoir. Counts were conducted utilizing a fixed wing airplane. Counts were made at 1000, 1400 and 1800 hours each day. All shore anglers and all fishing boats were counted.

Lowland Lake Gill Net Surveys

We set two standard diving and two standard floating, experimental gill nets in four separate locations in Brundage Reservoir on June 24, 1998. We also set two standard trap nets. Each net was set perpendicular to shore with the small mesh end or lead attached to the shore. The nets were set in the afternoon and pulled the next night.

We set two standard floating gill nets and one trap net in Lost Valley Reservoir on June 2, 1998. Each net was set perpendicular to the shore with the small mesh end of the net and trap net lead attached to shore. The nets were set in the afternoon and pulled the next morning.

Horsethief Reservoir

We conducted the Memorial Day weekend creel survey on May 23 and 24, 1998. All shore, boat, and float tube anglers were counted at two-hour intervals beginning at 0700, with the last count at 1900 hours, for a total of four counts each day. Between counts as many anglers as possible were contacted to record number of anglers per party, number of hours fished, species, and numbers of fish harvested.

Oxbow and Hells Canyon Reservoirs

Hells Canyon and Oxbow Reservoirs were electrofished and gillnetted to complete the lowland lakes standard surveys. Trap nets were not used at either reservoir due to their inefficiencies in these two waters. See intradepartmental memo on Lowland Lakes Standard Surveys, April 8, 1992 for description and methodology.

We set two floating and two diving standard survey gill nets in Hells Canyon and Oxbow reservoirs. We electrofished a total of 5.5 hours in Hells Canyon Reservoir and 6 hours in Oxbow Reservoir. Electrofishing sites were chosen at random. We electrofished a total of 10 minutes per site. Each of two boats worked a specific side of the reservoirs. We completed dissolved oxygen and temperature profiles at three locations in Hells Canyon Reservoir and 2 in Oxbow Reservoir. We also measured surface pH, alkalinity, and conductivity and made a Secchi disc reading.

Fish Lake

We utilized mark and recapture techniques to estimate the cutthroat trout population in Fish Lake. Fish were collected on October 21 and 22, 1998 with boat electrofishing gear. All fish collected were marked with a caudal punch, measured for total length and released. Fish were collected again on October 30, 1998 for recapture.

RESULTS

Payette Lake

Kokanee Population Status

We estimated the population size of wild, age 0+ and age 1+ kokanee in Payette Lake to be 461,034, ± 47% (95% CI) and 59,481 ± 78% fish respectively (Table 1). Mean densities (fish/ha) of age 0+ and 1+ were 269 and 35 fish/ha, respectively.

Total kokanee biomass, not including adult fish, (age 3+) was estimated at 1.75 kg/ha (the trawl does not collect age 3+ fish as efficiently as other age classes). Total biomass, including 1998 spawner escapement estimates (this report) was 3.8 kg/ha. There was a shoreline spawning component of the kokanee population which was not estimated but is felt to be fairly insignificant in terms of numbers.

Little Payette Lake

We collected 299 fish in gill nets during the survey on October 20, 1998. This included 149 largescale suckers, 103 Northern pikeminnow, 24 rainbow trout, 2 rainbow trout X cutthroat trout *Oncorhynchus clarki* hybrids, 2 smallmouth bass, and 19 newly introduced tiger muskie (Table 2).

Salmonids made up 8.8% of the biomass and 8.7% by number of all fish collected (Table 2). Rainbow trout ranged in total length from 268 to 519 mm. Rainbow trout X cutthroat trout hybrids ranged in total length from 582 to 596 mm. Quality sized (406 mm) rainbow trout and hybrids made up 30.8% of all trout collected. Of the 8 trout greater than 406 mm, two were rainbow X cutthroat hybrids (Table 3). Condition factors (Ktl) averaged 0.89 for all length groups of rainbow trout. Average rainbow trout Ktls were 0.76 and 1.02 for fish less than and greater than 406 mm, respectively (Table 4).

Cascade Reservoir Angler Counts

We counted more anglers this year than in recent surveys (Table 5). No structured creel surveys were conducted this year, however perch *Perca flavescens* fishing on the reservoir was virtually non-existent as the perch population had declined to historic lows. We felt that angling pressure on the reservoir was up in response to good catches of rainbow trout with success reportedly better this year than in the past several years.

Table 1. Summary of mid-water trawl data collected at Payette Lake, Idaho with 95% CI (±%). All estimates are based on a useable surface area of 1,715 ha (> 40 ft depth).

Year of Estimate	Number Stocked	AGE 0+	AGE 1+	AGE 2+	Spawners[1] 3+	
		Number of Hatchery Kokanee				
1988	350,000	34,000	0	0		
1989	350,000	18,000	0	0		
1990	301,000	27,000	0	0		
1991	158,000	?	?	0		
1992	130,530	19,774(79%)	?	?		
1993[3]	25,400	11,444(98%)	0	0		
1994	0 (stockings discontinued)		0			
		Number of Wild/Natural Kokanee				
1980		100,000	73,000	16,000	20,000	
1988		74,800(40%)	<2,000(85%)	9,000(88%)	22,800	
1989		120,000(33%)	21,000(33%)	0	14,500	
1990		134,000(45%)	26,000(45%)	10,000(100%)	16,700	
1991[2]		128,000(28%)	67,500	1,187	18,000	
1992		202,240(21%)	30,887(41%)	5,015(118%)	29,300	
1993[3]		301,744(104%)	117,215(65%)	7,271(83%)	59,310	
1994		152,689(88%)	46,974(54%)	30,432(99%)	44,200	
1995		194,242(57%)	107,929(33%)	54,635(65%)	55,450	
1996		251,339(51%)	132,234(63%)	35,205(44%)	60,707	
1997		105,815(43%)	334,873(38%)	48,027(57%)	64,891	
1998		461,034(47%)	59,481(78%)	38,773(70%)	25,232	
		Estimated Wild Kokanee Densities (fish/ha)				
1980		58	43	9		
1988		44	<2	5	13	
1989		70	12	0	8	
1990		78	15	6	10	
1991[2]		75	39	0.69	10.5	
1992		118	18	3	17	
1993[3]		176	68	4	35	
1994		89	27	18	26	
1995		113	63	32	32	
1996		147	77	21	35	
1997		62	195	28	38	
1998		269	35	23	15	
		Estimated Wild Kokanee Biomass (KG/HA)			TOTAL	
1980		.04	0.9	0.5		
1988		.06	.03	NA	4.6	4.7
1989			0.24 (for ages 0+,1+ and 2+ combined)		2.9	2.9
1990		.07	0.13	0.8	3.5	4.5
1991			.075	1.2[2]	0.1	5.3 6.7
1992		.15	1.1	0.45	6.4	8.1
1993			.10	1.8	0.6	8.5 11.0
1994		.10	1.9	0.6	5.5	8.1
1995		.04	1.4	2.8	4.8	9.0
1996		.05	1.07	1.6	5.7	8.4
1997		.007	2.3	1.8	5.6	9.7
1998		.15	.40	1.2	2.1	3.8

[1] Based on corrected spawner escapement counts in N. Fork Payette River (1.73 X peak spawner count)(Frost and Bennett, 1994)
[2] Includes age 0+ hatchery fish.
[3] Estimate was made in August instead of September when other years' estimates were made.

Table 2. Numbers and biomass of all species of fish collected with gill nets on October 20, 1998 on Little Payette Lake.

Species	N	% of total by number	Total weight (kg)	% of total by weight
Rainbow trout	24	8.0	10.1	6.2
Rainbow X cutthroat hybrid	2	0.7	4.2	2.6
Northern pikeminnow	103	34.4	33.7	21.0
Largescale sucker	149	50.0	79.0	49.0
Tiger muskie	19	6.4	31.9	19.7
Smallmouth bass	2	0.7	2.9	1.8
Total	299		161.8	

Table 3. Length frequencies of rainbow trout and rainbow X cutthroat trout (#) hybrids gillnetted in Little Payette Lake in October 1998.

Total length (mm)	Total number
200	0
210	0
220	0
230	0
240	0
250	0
260	1
270	4
280	3
290	5
300	2
310	0
320	1
330	1
340	1
350	0
360	0
370	0
380	0
390	0
400	0
410	0
420	0
430	2
440	0
450	1
460	0
470	0
480	1
490	0
500	0
510	2
580	(1)
590	(1)

Table 4. Average length, weight and condition (Ktl) of rainbow trout, by length of group, collected from Little Payette Lake on October 20, 1998.

Total length (mm)	N	Average length (mm)	Average weight (g)	Average Ktl
0-406 (<16 inch)	18	294	196	0.76
407-550 (16 inch)	8	502	1,346	1.02

Table 5. Average boat and shore angler counts on Cascade Reservoir on three major holidays: Memorial Day, July 4th and Labor Day in 1982, 1991, 1992 and 1996 through 1998 with corresponding intensive creel survey annual pressure estimates for 1982, 1991, and 1992.

	Year					
	1982	1991	1992	1996	1997	1998
	Average of holiday counts					
Average number boats	154	41.5	52.5	35	36.5	58
Average number shore anglers	85	32	116	27	19	39.5
	Actual pressure estimate (hours x 1,000)					
Boat	255.6	135.2	144.2	NA	NA	NA
Shore	129.8	102.0	177.3	NA	NA	NA
Total pressure	385.4	237.2	321.5	NA	NA	NA

Standard Lowland Lake Surveys

Brundage Reservoir

We collected 38 rainbow trout and 3 westslope cutthroat trout on June 24, 1998 (Table 6). Fish ranged in size from 171 mm and 46 g to 354 mm and 384 g or rainbow trout and from 242 mm and 126 g to 276 mm and 192 g for cutthroat trout. Condition factors averaged 0.93 and 1.17 for rainbow and cutthroat trout, respectively. Of all the rainbow and cutthroat trout collected 58% and 100 % respectively appeared to be of wild origin (straight fins). No other fish species were collected.

Lost Valley Reservoir

We collected four species of fish from Lost Valley including 452 yellow perch, the majority of which were sexually mature, spawning adults. We also collected 8 splake *Salvelinus fontinalis x Salvelinus namaycush*, 3 westslope cutthroat, 5 brook trout *Salvelinus fontinalis* and 29 rainbow trout. Length frequencies, average weight and condition factors of trout are presented in Table 6. Yellow perch lengths ranged from 152 mm to 244 mm.

Table 6. Length frequencies, average weight, average condition factors (Ktl) or (Wr) of rainbow trout, cutthroat trout, brook trout, and splake collected from Brundage and Lost Valley reservoirs, 1998.

Total length inches (mm)	Water: Brundage (RBT) Number	Ave. weight (g)	Ktl	Brundage (CTT) Number	Ave. wight (g)	Ktl	Lost Valley (BRK) Number	Ave. weight (g)	Wr	Lost Valley (RBT) Number	Ave. weight (g)	Wr	Lost Valley (splake) Number	Ave. weight (g)	Ktl
4(102)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5(127)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6(152)	1	46	0.92	0	0	0	0	0	0	0	0	0	0	0	0
7(178)	0	0	0	0	0	0	0	0	0	0	0	0	1	70	0
8(203)	2	101	0.96	0	0	0	3	94	76.2	2	105	1.0	1	90	0
9(229)	11	133.5	0.96	1	126	1.12	1	116	73.7	13	143	1.01	4	127	0
10(250)	10	171	0.89	2	172	1.19	1	144	67.2	6	180	0.98	1	176	0
11(280)	6	230	0.93	0	0	0	0	0	0	2	263	1.01	1	178	0
12(305)	2	284	0.90	0	0	0	0	0	0	3	341	1.05	0	0	0
13(330)	6	376	0.94	0	0	0	0	0	0	0	0	0	0	0	0
14(356)	0	0	0	0	0	0	0	0	0	1	496	0.96	0	0	0
15(381)	0	0	0	0	0	0	0	0	0	1	565	0.92	0	0	0
16(422)	0	0	0	0	0	0	0	0	0	1	770	1.02	0	0	0

Horsethief Reservoir

We estimated 4,756 angler hours were spent to catch 2,149 fish on May 23 and 24, 1998 (Table 7). The overall catch rate was 0.45 trout/h. The catch composition was 53% rainbow trout and 35% brown trout *Salmo trutta*. We found that 10% of the harvest was yellow perch. Total estimated angler hours were comprised of 60% shore anglers, 35% boat anglers and 5% float tube anglers.

Total fishing pressure between days was similar with 2,544 total hours spent on Saturday and 2,212 total hours spent on Sunday. Trout harvest rates were better on Saturday (0.48 f/h) than Sunday (0.32 f/h). Yellow perch were observed in the creel with a harvest rate of 0.046 fish/h, however most perch were released due to small size.

Oxbow and Hells Canyon Reservoirs

We found smallmouth bass and channel catfish *Ictalurus punctatus* to be the most abundant fish in Oxbow Reservoir (Table 8) and smallmouth bass and white crappie *Pomoxis annularis* the most abundant in Hell's Canyon Reservoir (Table 9). Total biomass was dominated by channel catfish and smallmouth bass in Oxbow Reservoir, and by carp *Cyprinus carpio* and smallmouth bass in Hell's Canyon Reservoir. We collected a total of 16 species of fish from Oxbow Reservoir and 16 species from Hells Canyon Reservoir. Total number, average weights, and relative weights by one cm length increments for each game species are presented in Tables 10 and 11 for Oxbow Reservoir and in Tables 12 and 13 for Hells Canyon Reservoir. Average back-calculated lengths for each age class of each game species collected from Oxbow and Hells Canyon Reservoirs are presented in Tables 14 and 15.

We found water temperatures were high for trout in both reservoirs (Tables 16 & 17). Temperatures in Oxbow ranged from 22.4 to 25.6°C and from 22.8 to 27.8°C in Hells Canyon Reservoir. Dissolved oxygen was found to be 3.9 ppm or higher down to 30 m in both reservoirs. We measured pH, total alkalinity, conductivity and Secchi to be 7.6, 180 ppm, 270 umHOS, and 12 feet, respectively. The trout habitat volume was 0% in both reservoirs.

Table 7. Estimates of total angling pressure, catch rates and harvest for Horsethief Reservoir from 1974 through 1988 and 1997 through 1999.

	Total estimated angling pressure				Estimated trout catch rate (fish/hr)				Estimated # of fish harvested					
Date	Shore	Boat	Tube	Total	Shore	Boat	Tube	All	RBT	BRN	YP	CTT	BRK	Total
1974	--	--	--	12,134	--	--	--	0.61	7,444	0	0	0	0	7,444
1975	--	--	--	7,786	--	--	--	0.40	3,137	0	0	0	8	3,145
1976	--	--	--	12,345	--	--	--	0.84	9,944	0	0	149	224	10,347
1977	--	--	--	7,443	--	--	--	0.64	4,620	0	0	148	51	4,819
1978	--	--	--	8,847	--	--	--	0.34	3,040	0	0	27	18	3,085
1979	--	--	--	5,876	0.48	0.21	1.53	0.41	1,909	0	0	329	197	2,435
1980	--	--	--	3,167	0.98	2.60	5.13	1.91	6,044	0	0	0	12	6,056
1981[a]	--	--	--	--	--	--	--	1.04	--	--	--	--	--	--
1982	--	--	--	8,688	0.52	0.77	1.17	0.62	4,759	0	0	142	167	5,068
1983	--	--	--	4,685	0.52	0.53	0.31	0.48	2,153	0	0	25	89	2,267
1984	--	--	--	3,477	0.12	0.87	0.68	0.40	1,379	0	0	0	1	1,380
1985	--	--	--	6,205	1.33	1.70	1.57	1.45	8,982	0	0	0	0	8,982
1986	--	--	--	7,940	0.78	0.90	0.50	0.79	6,271	0	0	0	1	6,272
1987	--	--	--	6,452	0.53	0.95	1.03	0.67	4,489	0	0	0	13	4,502
1988[b]	--	--	--	1,905	0.39	0.23	1.13	0.31	458	0	0	5	0	463
5/24/97	787.5	297	105	1,189.5	0.82	1.13	0.5	.87	1,022	12	0	0	0	1034
5/25/97	859.5	334.5	57.45	1,251	0.35	1.17	0.8	.59	734	4	0	0	0	738
5/23/98	1,784	624	136	2,544	0.40	0.62	0.83	0.48	838	347	221	37	0	1443
5/24/98	1,096	1,004	112	2,212	0.34	0.33	NA	0.32	312	388	0	6	0	706

[a] Only catch rate was calculated from a sample of anglers.
[b] Only one day of weekend was surveyed; first year of year-round fishing.

Table 8. Percent frequency and relative biomass of all species of fish collected July 15, 1998 in Oxbow Reservoir (all gear types combined).

Species	# caught	% of catch	Total biomass (g)	% of total weight
Smallmouth bass	678	45.53	146.652	33.80
Channel catfish	321	21.56	167.938	38.70
Bluegill *Lepomis macrochirus*	182	12.22	21.353	4.90
Chiselmouth *Acrocheilus alutaceus*	111	7.45	18.220	4.20
Northern pikeminnow	60	4.03	17.815	4.10
Black crappie *Pomoxis nigromaculatus*	52	3.49	5.153	1.20
Rainbow trout	17	1.14	3.422	0.80
Largescale sucker	16	1.07	12.925	3.00
Yellow perch	15	1.01	1.685	0.40
White crappie	14	0.94	1.524	0.35
Carp	10	0.67	32.755	7.50
Bridgelip sucker *Catostomus*	10	0.67	3.970	0.90
Pumpkinseed *Lepomis gibbosus*	2	0.13	275	0.06
Flathead catfish *Pylodictis olivaris*	1	0.07	445	0.10

NOTE: Mottled sculpin *Cottus bairdi* and bullheads *Ameiurus spp.* were also present

Table 9. Percent frequency and relative biomass of all species of fish collected July 15, 1998 in Hells Canyon (all gear types combined).

Species	# caught	% of catch	Total biomass (g)	% of total weight
Smallmouth Bass	817	46.63	82,828	17.4
White Crappie	161	9.19	20,270	4.3
Bluegill	143	8.16	15,436	3.2
Carp	109	6.22	155,857	32.7
Bridge Lip Sucker	94	5.37	38,919	8.2
Channel Catfish	90	5.14	59,173	12.4
Largescale Sucker	74	4.22	53,207	11.2
Black Crappie	65	3.71	6,988	1.5
Northern Pikeminnow	57	3.25	21,892	4.6
Chiselmouth	46	2.63	4,025	0.8
Rainbow Trout	42	2.40	7,889	1.7
Yellow Perch	37	2.11	4,956	1.0
Pumpkinseed	10	0.57	750	0.2
Mountain Whitefish *Prosopium williamsoni*	7	0.40	4,100	0.9

NOTE: Sculpin, warmouth *Lepomis gulosus* and dace *Rhinichthys spp.* also present.

Table 10. Number, length, average weights and relative weights of smallmouth bass, channel catfish, and bluegill collected July 1, 1998 from Oxbow Reservoir.

Total length	Smallmouth bass				Channel catfish				Bluegill			
	# coll.	% of total	Avg. wt	Rel. wt	# coll.	% of total	Avg. wt	Rel. wt	# coll.	% of total	Avg. wt	Rel. wt
50	No fish sampled				No fish sampled				26	14.3	2.0	110.0
60	44	6.5	4.0	111.3					2	1.1	5.0	115.2
70	No fish sampled								No fish sampled			
80	52	7.7	10.0	122.6								
90	37	5.5	9.0	78.6					2	1.1	15.0	98.2
100	26	3.8	12.5	90.5					3	1.6	18.0	84.5
110	10	1.5	15.0	79.2					4	2.2	35.0	121.6
120	3	0.4	22.0	83.1					No fish sampled			
130	No fish sampled								10	5.5	55.0	112.2
140	4	0.6	55.0	131.9					9	4.9	70.0	112.7
150	7	1.0	60.0	119.7					27	14.8	95.0	122.6
160	33	4.9	70.0	113.2	1	0.3	40.0	126.8	24	13.2	140.0	146.9
170	18	2.6	80.0	108	No fish sampled				24	13.2	148.7	128.4
180	22	3.2	100.0	122.3	2	0.6	45.0	83.1	28	15.4	190.0	136.4
190	7	1.0	107.5	108.5	5	1.6	70.0	113.0	13	7.1	209.0	104.3
200	6	0.9	117.0	97.4	8	2.5	65.0	91.7	8	4.4	238.7	124.7
210	8	1.2	172.5	120.6	14	4.4	75.8	92.4	2	1.1	222.5	95.2
220	14	2.1	171.0	105.9	14	4.4	87.5	93.3				
230	16	2.4	197.0	110.4	13	4	98.3	89.0				
240	26	3.8	202.0	103.1	21	6.5	96.0	77.3				
250	37	5.5	225.0	98.1	14	4.4	127.0	89.6	No fish sampled			
260	59	8.7	270.0	102.9	14	4.4	131.2	80.5				
270	55	8.1	264.0	91.4	3	0.9	175.0	95.8				
280	45	6.6	324.0	100.1	16	5.0	158.7	78.1				
290	24	3.5	336.0	95.0	17	5.3	181.0	81.3				
300	27	4.0	400.0	102.4	4	1.2	235.0	89.1				
310	16	2.4	395.0	88.7	11	3.4	216.7	79.3				
320	17	2.5	466.0	97.3	5	1.6	280.0	92.8				
330	12	1.8	519.0	96.9	3	0.9	290.0	83.7				
340	10	1.5	453.7	77.9	6	1.9	290.0	79.0				
350	17	2.5	580.0	91.4	7	2.2	435.0	103.7				
360	7	1.0	585.8	88.3	6	1.9	355.0	80.4				
370	6	0.9	691.0	94.1	10	3.1	453.7	91.6				
380	4	0.6	730.0	91.0	5	1.6	460.0	84.6				
390	7	1.0	696.7	82.5	10	3.1	516.7	88.6				
400	2	0.3	865.0	92.1	4	1.2	600.0	93.6				
410					3	0.9	650.0	93.7				
420					7	2.2	670.0	85.4				
430					6	1.9	655.0	81.6				
440					7	2.2	700.0	80.4				
450					18	5.6	845.7	89.8				
460					13	4.0	961.7	95.2				
470					8	2.5	970.0	90.2				
480					8	2.5	1,040.0	92.9				
490					5	1.6	1,110.0	90.9				
500					5	1.6	1,145.0	89.9				
510					4	1.2	1,137.0	81.4				

Table 10. Continued.

Total length	Smallmouth bass				Channel catfish				Bluegill			
	# coll.	% of total	Avg. wt	Rel. wt	# coll.	% of total	Avg. wt	Rel. wt	# coll.	% of total	Avg. wt	Rel. wt
520					4	0.9	1,150	77.3				
530					1	0.3	1,300	82.2				
540					2	0.6	1,500	89.3				
550					7	2.2	1,725	97.9				
560					2	0.6	2,250	117.3				
570					2	0.6	2,200	110.1				
580					2	0.6	2,012	107.1				
590					1	0.3	2,500	112.0				
610					2	0.6	2,920	116.9				
760					2	0.6	4,250	86.1				

Table 11. Number, total lengths, weights and relative weights of black crappie, yellow perch, and white crappie collected July 1, 1998 from Oxbow Reservoir.

Total length	Black crappie				Yellow perch				White crappie			
	# coll.	% of total	Avg. wt	Rel. wt	# coll.	% of total	Avg. wt	Rel. wt	# coll.	% of total	Avg. wt	Rel. wt
40	No fish sampled				No fish sampled				1	7.1	1.0	139.2
50									No fish sampled			
60												
70												
80												
90	1	1.9	12.0	120.7								
100	No fish sampled											
110												
120												
130												
140												
150	1	1.9	75.0	146.7								
160	10	19.2	83.7	137.4					1	7.1	73.5	134.8
170	24	46.2	83.3	124.8	4	14.8	62.5	81.1	2	14.3	80.0	120.6
180	9	17.3	111.2	130.1	2	8.9	75.0	86.7	5	35.7	90.0	114.8
190	4	7.7	122.5	119.3	5	28.2	95.0	91.8	3	21.4	110.0	126.1
200	No fish sampled											
210	1	1.9	147.0	104.1	No fish sampled							
220	No fish sampled											
230					2	22	185.0	98.8	No fish sampled			
240					2	26.1	220.0	100				
250	2	3.8	235.0	91.7	No fish sampled							
260	No fish sampled								2	14.3	255.0	102.8

Table 12. Number, total lengths, weights, and relative weights of smallmouth bass, white crappie, and bluegill collected July 15, 1998, from Hells Canyon Reservoir.

Total length	Smallmouth bass				White crappie				Bluegill			
	# coll.	% of total	Avg. wt	Rel. wt	# coll.	% of total	Avg. wt	Rel. wt	# coll.	% of total	Avg. wt	Rel. wt
40	No fish sampled								1	0.7	2.0	155.9
50									No fish sampled			
60												
70	8	1.0	7.0	125.8	No fish sampled				12	8.3	10.0	143.3
80	61	7.5	10.0	122.6					No fish sampled			
90	147	18.0	12.5	109.1								
100	124	15.2	20.0	128.6								
110	106	13.0	25.0	121.8	1	0.6	15.0	91.6	1	0.7	35.0	121.6
120	31	38.0	28.0	105.7	2	1.2	18.0	83.2	1	0.7	45.0	118.5
130	12	1.5	30.0	89.5	No fish sampled				8	5.6	60.0	122.5
140	5	0.6	45.0	108.0					17	11.9	76.2	124.2
150	19	2.3	58.5	110.7	1	0.6	60.0	135.5	15	10.5	84.4	113.5
160	31	3.8	60.0	97.0	8	5.0	73.5	139.5	21	14.7	111.6	120.3
170	17	2.1	70.0	94.5	1	0.6	80.0	120.6	34	23.8	125.3	109.2
180	3	0.4	70.0	79. 8	29	18.0	88.1	116.4	17	11.9	156.0	111.3
190	1	0.1	100.0	97.0	25	15.5	102.3	109.4	10	7.0	156.8	102.2
200	7	0.9	117.0	100.5	19	11.8	122.0	97.1	4	2.8	205.0	111.1
210	6	0.7	127.0	88.3	24	14.9	130.8	97.5	2	1.4	274.0	129.2
220	3	0.4	150.0	94.0	25	15.5	165.0	108.2	No fish sampled			
230	20	2.4	189.0	101.8	24	14.9	181.5	102.5				
240	33	4.0	173.3	80.9	2	1.2	220.0	108.1				
250	38	4.7	223.4	97.8	No fish sampled							
260	30	3.7	225.8	89.5								
270	26	3.2	273.8	96.5								
280	23	28.0	272.5	86.1								
290	17	2.1	301.7	85.9								
300	17	2.1	348.9	89.0								
310	10	1.2	409.2	94.4								
320	4	0.5	442.0	91.9								
330	1	0.1	574.0	111.9								
340	3	0.4	458.0	75.7								
350	3	0.4	354.0	57.0								
360	2	0.2	660.0	98.4								
370	1	0.1	685.0	90.2								
400	4	0.5	826.0	84.4								
410	4	0.5	962.5	92.9								

Table 13. Number, total lengths, weights, and relative weights of channel catfish, black crappie, and yellow perch collected July 15, 1998, from Hells Canyon Reservoir.

Total length	Channel catfish				Black crappie				Yellow perch			
	# coll.	% of total	Avg. wt	Rel. wt	# coll.	% of total	Avg. wt	Rel. wt	# coll.	% of total	Avg. wt	Rel. wt
100	No fish sampled				2	3.1	16.0	111.5	No fish sampled			
110					3	4.6	15.0	73.1				
120					No fish sampled							
130					2	3.1	30.0	93.1				
140					No fish sampled							
150					1	1.5	55.0	107.6				
160					13	20.0	69.4	106.5				
170	1	1.1	44.0	112.4	12	18.5	90.0	119.6	2	5.4	90.0	110.7
180	No fish sampled				9	13.8	110.0	120.7	2	5.4	100.0	104.1
190					2	3.1	118.0	116.8	6	16.2	94.7	89.8
200					4	6.2	153.5	117.7	5	13.5	125.0	103.7
210					8	12.3	144.2	98.1	7	18.9	137.0	104.0
220	1	1.1	125.0	131.2	5	7.7	166.0	90.0	12	32.4	154.0	96.9
230	No fish sampled				No fish sampled				2	5.4	178.0	95.0
240	2	2.2	120.0	98.1	4	6.2	247.5	108.5	1	2.7	220.0	109.7
250	4	4.4	114.0	79.9	No fish sampled				No fish sampled			
260	2	2.2	128.0	84.0								
270	5	5.6	175.0	95.8								
280	2	2.2	178.0	86.8								
290	No fish sampled											
300	2	2.2	185.0	76.4								
310	6	6.7	202.5	72.2								
320	2	2.2	250.0	83.7								
330	8	8.9	307.7	91.7								
340	2	2.2	340.0	93.5								
350	6	6.7	339.0	79.6								
360	No fish sampled											
370												
380												
390	3	3.3	392.0	65.2								
400	3	3.3	600.0	97.4								
410	1	1.1	650.0	97.4								
420	4	4.4	700.0	94.1								
430	2	2.2	662.0	85.0								
440	No fish sampled											
450	3	3.3	750.0	82.5								
460	2	2.2	930.0	92.7								
470	6	6.7	766.7	71.9								

Table 13. Continued.

Total length	Channel catfish				Black crappie				Yellow perch			
	# coll.	% of total	Avg. wt	Rel. wt	# coll.	% of total	Avg. wt	Rel. wt	# coll.	% of total	Avg. wt	Rel. wt
480	6	6.7	933.3	82.3	No fish sampled				No fish sampled			
490	2	2.2	1,000.0	81.4								
500	2	2.2	1,200.0	94.5								
510	2	2.2	1,075.0	79.4								
520	2	2.2	1,125.0	78.0								
530	No fish sampled											
540												
550	6	6.7	2,150.0	121.8								
560	1	1.1	2,000.0	106.0								
570	2	2.2	1,900.0	95.6								

Table 14. Average back-calculated lengths for each age class of each species collected July 1, 1998 from Oxbow Reservoir.

Year class	Age	N	Back-calculation age																			
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Smallmouth bass																							
1997	1	2	89																				
1996	2	10	92	164																			
1995	3	34	93	155	214																		
1994	4	12	93	155	219	262																	
1993	5	8	91	137	198	252	282																
1992	6	8	85	134	185	229	281	320															
1991	7	8	85	124	174	212	250	287	319														
1990	8	7	81	125	159	193	227	255	289	314													
1989	9	1	78	109	152	175	228	267	312	351	374												
All classes			90	147	200	232	260	288	305	318	374												
N		90	90	88	78	44	32	24	16	8	1												
Channel catfish																							
1997	1	0	0																				
1996	2	1	65	158																			
1995	3	20	66	125	201																		
1994	4	19	51	89	146	212																	
1993	5	9	56	122	196	244	293																
1992	3	4	84	142	204	270	319	368															
1991	7	9	81	134	200	247	316	360	392														
1990	8	8	76	139	203	257	303	341	381	411													
1989	9	7	82	134	171	222	279	318	352	382	412												
1988	10	6	76	122	169	208	253	297	336	372	401	433											
1987	11	0	0	0	0	0	0	0	0	0	0	0	0										
1986	12	2	78	117	166	206	234	264	294	316	332	362	380	396									
1985	13	2	80	121	174	214	243	263	272	281	293	305	320	331	347								
1984	14	1	80	136	160	188	202	258	276	293	304	318	325	335	349	360							
1983	15	1	74	142	228	309	356	411	428	454	488	497	505	518	548	569	586						

Table 14. Continued.

Year class	Age	N	Back-calculation age																				
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1977	21	1	119	180	237	280	315	368	411	455	503	568	581	594	629	646	660	682	695	708	716	729	743
All classes			68	121	183	232	290	330	360	378	392	409	401	415	444	525	623	682	695	708	716	729	743
N		90	90	90	89	69	50	41	37	28	20	13	7	7	5	3	2	1	1	1	1	1	1
Note: No catfish caught for year class 1989-1982																							
Bluegill																							
1997	1	0	0																				
1996	2	1	64	149																			
1995	3	1	70	123	180																		
1994	4	1	46	85	161	179																	
1993	5	1	45	88	122	162	187																
1992	6	1	56	81	110	133	180	206															
All classes			56	105	143	158	183	206															
N		5	5	5	4	3	2	1															
Black crappie																							
1997	1	0	0																				
1996	2	10	81	146																			
1995	3	1	102	137	179																		
1994	4	1	90	175	211	240																	
All classes			84	148	195	240																	
N		12	12	12	2	1																	
Yellow perch																							
1997	1	0	0																				
1996	2	3	83	153																			
1995	3	3	89	143	190																		
All classes			86	148	190																		
N		6	6	6	3																		
White crappie																							
1997	1	0	0																				
1996	2	2	87	164																			
1995	3	1	116	190	248																		
All classes			97	173	248																		
N		3	3	3	1																		

Table 15. Average back-calculated lengths for each age class of each species collected July 15, 1998, from Hells Canyon Reservoir.

Year class	Age	N	Back-calculation age														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Smallmouth bass																	
1997	1	0	0														
1996	2	2	111	218													
1995	3	7	94	152	203												
1994	4	24	94	142	203	252											
1993	5	12	88	137	192	241	283										
1992	6	6	85	132	180	222	265	295									
1991	7	3	88	129	170	221	251	296	335								
1990	8	0	0	0	0	0	0	0	0	0							
1989	9	1	109	150	186	225	254	285	309	338	381						
All classes			92	143	196	243	273	294	329	338	381						
N		55	55	55	53	46	22	10	4	1	1						
White crappie																	
1997	1	1	101														
1996	2	22	89	154													
1995	3	9	92	136	190												
1994	4	10	90	125	166	210											
All classes			90	143	177	210											
N		42	42	41	19	10											
Bluegill																	
1997	1	0	0														
1996	2	0	0	0													
1995	3	7	48	79	126												
1994	4	23	50	81	122	159											
1993	5	5	44	72	111	138	164										
All classes			49	79	121	155	164										
N		35	35	35	35	28	5										
Channel catfish																	
1997	1	0	0														
1996	2	1	50	90													
1995	3	5	86	143	216												
1994	4	2	71	168	233	267											
1993	5	3	68	129	163	226	301										

Table 15. Continued.

Year class	Age	N	Back-calculation age														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1992	6	3	103	165	233	286	344	402									
1991	7	6	73	129	188	239	288	328	364								
1990	8	4	82	145	210	261	304	349	382	404							
1989	9	4	89	142	193	233	285	339	385	419	463						
1988	10	2	92	162	195	231	279	307	351	399	432	466					
1987	11	2	41	70	110	160	189	205	237	258	276	297	315				
1986	12	0	0	0	0	0	0	0	0	0	0	0	0	0			
1985	13	3	56	103	145	195	233	282	312	339	354	378	393	409	421		
1984	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1983	15	2	25	60	110	140	166	198	276	322	360	393	422	446	458	486	505
All classes			74	131	187	230	275	315	344	368	389	383	379	424	436	486	505
N		37	37	37	36	31	29	26	23	17	13	9	7	5	5	2	2
Black crappie																	
1997	1	0	0														
1996	2	5	86	148													
1995	3	1	76	179	232												
1994	4	4	187	350	524	640											
All classes			125	232	466	640											
N		10	10	10	5	4											
Yellow perch																	
1997	1	0	0														
1996	2	0	0	0													
1995	3	0	0	0	0												
1994	4	2	71	105	144	179											
1993	5	3	70	104	129	163	191										
All classes			71	104	135	169	191										
N		5	5	5	5	5	3										

Table 16. Oxbow Reservoir dissolved oxygen (mg/l) and temperature profiles by location measured August 3, 1998.

	Middle Dirt Boat Ramp		Hot Spring	
Depth (m)	Temp	DO	Temp	DO
0	22.5	4.5	25.6	4.9
1	22.5	4.4	23.5	4.8
2	22.9	4.5	23.0	4.7
3	22.5	4.5	22.9	4.6
4	22.6	4.5	23.0	4.6
5	22.5	4.5	22.9	4.6
6	22.4	4.6	23.0	4.5
7	22.3	4.6	22.9	4.5
8	22.3	4.6	22.9	4.5
9	22.3	4.5	23.0	4.5
10	22.3	4.6	22.9	4.5
11	22.2	4.6	22.9	4.5
12	22.2	4.6	22.9	4.5
13	22.0	4.5	22.9	4.4
14	22.1	4.5	23.0	4.5
15	22.1	4.5	23.0	4.5
16			22.9	4.5
17			23.0	4.5
18			22.9	4.5
19			23.0	4.5
20			22.8	4.4
21			22.8	4.4
22			22.5	4.3
23			22.3	4.2
24			22.2	3.8
25			22.4	3.8
30			22.4	3.9

Table 17. Hells Canyon Reservoir Dissolved Oxygen (mg/l) and temperature profiles by location measured August 3, 1998.

Depth	2 miles above dam		1 mile above dam		Above Big Bar	
	Temp	DO	Temp	DO	Temp	DO
S	26.8	8.4	27.8	7.3	27.5	6.3
1	24.5	8.1	25.0	7.4	25.1	6.3
2	23.9	6.2	24.1	7.2	23.9	6.3
3	23.9	6.1	24.1	7.3	23.5	6.2
4	23.8	6.0	23.9	7.2	23.2	6.3
5	23.8	6.0	23.8	6.9	23.2	6.2
6	23.7	6.0	23.5	6.5	23.1	6.1
7	23.8	5.9	23.5	6.4	23.2	5.9
8	23.7	5.8	23.4	6.2	23.2	5.9
9	23.5	5.5	23.2	6.0	23.1	5.7
10	23.4	5.4	23.1	5.9	23.1	5.7
11	23.2	5.3	23.1	5.6	23.1	5.7
12	23.1	5.2	23.0	5.5	23.1	5.7
13	23.1	5.1	23.0	5.4	23.0	5.7
14	23.0	5.0	23.0	5.4	23.0	5.7
15	23.0	5.0	22.9	5.3	23.0	5.6
16	23.0	5.0	22.9	5.3	23.0	5.6
17	23.0	5.0	22.8	5.2	23.0	5.5
18	23.0	4.9	22.9	5.2	23.0	5.5
19	23.0	4.9	22.9	5.2	23.0	5.5
20	23.0	4.9	22.9	5.2	23.0	5.5
21	23.0	4.9	22.9	5.2	23.0	5.4
22	23.0	4.9	22.9	5.2	23.0	5.4
23	23.0	4.9	22.9	5.2	23.0	5.4
24	23.0	4.9	22.9	5.2	23.0	5.3
25	23.0	4.9	22.9	5.2	23.0	5.3
26	23.0	4.9	22.9	5.1	23.0	5.2
27	23.0	4.9	22.8	5.1	23.0	5.2
28	23.0	4.9	22.8	5.1	23.0	5.2
29	23.0	4.9	22.8	5.0	23.0	5.2
30	22.9	4.9	22.8	5.0	23.0	5.2

Fish Lake

We collected a total of 227 cutthroat trout on October 21 and 22, 1998. Lengths ranged from 90 mm to 520 mm (Table 18). We collected a total of 158 cutthroat trout on October 30, 1998 of which 38 or 24% were recaptures. The total population estimate was 944, ±98 fish. The estimate of fish greater than 270 mm (next year's spawners) was 385, ±148.

Table 18. Length frequencies of westslope cutthroat trout collected from Fish Lake on October 21-22, 1998.

Total Length (mm)	Total Number
90	1
100	0
110	1
120	0
130	0
140	0
150	3
160	3
170	5
180	5
190	13
200	10
210	7
220	15
230	14
240	11
250	21
260	16
270	19
280	14
290	16
300	8
310	11
320	6
330	6
340	1
350	1
360	4
370	1
380	4
390	3
400	2
410	0
420	3
430	2
440	0
450	0
460	0
470	0
480	0
500	0
510	0
520	1

RECOMMENDATIONS

1. Evaluate trawling to determine its value as a management tool.

2. Continue to monitor nongame fish populations and their effects on rainbow trout in Little Payette Lake.

3. Continue holiday angler counts on Cascade Reservoir to monitor angling pressure.

4. Continue Horsethief Reservoir creel surveys on Memorial Day weekend and monitor perch population.

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Project I: Surveys and Inventories

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ABSTRACT

The yellow perch *Perca flavescens* population in Cascade Reservoir appeared to have become severely depressed since 1995. Anglers reported generally poor to no yellow perch fishing success during all seasons of the year from 1996 through 1998. Entrainment of large numbers of yellow perch through the dam was documented from 1992 through 1995. Investigations were begun to determine the population structure of yellow perch in the reservoir and the timing, extent and population impacts of the entrainment. Movement and migration studies began in the reservoir to determine if and when yellow perch were vulnerable to entrainment. Population sampling revealed severely depressed yellow perch numbers with virtually no fish collected between 100 and 250 mm. There had been essentially no survival of juvenile fish since the early 1990s. We collected many sick, moribund and dead juvenile yellow perch. The majority of the juvenile fish collected were found to have high parasite loads. High juvenile yellow perch mortality in the early 1990s was likely due to predation by the strong 1989 and 1990 age classes, however causes for high juvenile mortality rates since 1994 are unknown. It appears that entrainment of large numbers of yellow perch is an indicator of good yellow perch numbers in the reservoir and not the cause of the decline. Water quality and disease interactions appeared to have played a role in the yellow perch decline.

Authors:

Paul Janssen
Regional Fishery Biologist

Don Anderson
Regional Fishery Manager

INTRODUCTION

The yellow perch *Perca flavescens* population in Cascade Reservoir appeared to have become severely depressed since 1995. While no structured creel surveys were conducted recently, anglers reported generally poor to no yellow perch fishing success during all seasons of the year from 1996 through 1998. Angler counts made during the holidays in 1996 and 1997 indicated that angling pressure was the lowest recorded in the 1980s and 1990s (Table 1). Idaho Department of Fish and Game (IDFG) biologists expected very good perch fishing from 1994 through 1998 as the strong 1989 and 1990 age classes of perch grew to preferred harvest size (Janssen and Anderson 1994). This fishery however, never materialized.

Table 1. Average boat and shore angler counts on Cascade Reservoir on three major holidays: Memorial Day, July 4th and Labor Day, in 1982, 1991, 1992, 1996, 1997, and 1998 with corresponding intensive creel survey annual pressure estimates for 1982, 1986, 1991, and 1992.

	Year						
	1982	1986	1991	1992	1996	1997	1998
	Average of holiday counts						
Ave # boats	154		41.5	52.5	35	36.5	58
Ave # shore anglers	85		32	116	27	19	39.5
Total of averages	239		73.5	168.5	62	55.5	97.5
Actual Pressure Estimate (hours x 1000)							
Boat	255.6	212.8	135.2	144.2	NA	NA	NA
Shore	129.8	128.1	102.0	177.3	NA	NA	NA
Total pressure[a]	385.4	340.9	237.2	321.5	122.7[b]	110.1[b]	

[a] Does not include ice fishing pressure
[b] Estimated as a proportion of the 1982, 1991 and 1992 surveys.

The poor fishing caused a pronounced drop in angler use on the reservoir and serious loss of economic value of the fishery. Assuming four hours in an angler day, and using a $52.90 average value per day of fishing in Idaho (*1996 National Survey of Hunting, Fishing and Wildlife-Associated Recreation*, Preliminary Findings U.S. Fish and Wildlife Service, 1997), we estimated relative economic values for the reservoir. From angler creel survey data we calculated the average angler use in 1982, 1986, 1991 and 1992 to be 78,700 angler days. Angler use in 1996 and 1997 was then estimated from holiday counts to be 30,700 and 28,100 angler days, respectively. This demonstrated a foregone economic value of approximately $2.5 million in 1996 and 1997.

While yellow perch fishing success was slow in the reservoir we had evidence of very large numbers of yellow perch being entrained through Cascade Reservoir Dam between 1993 and 1995.

McCall Fish Hatchery personnel netted just below Cascade Reservoir Dam in May 1993 to collect perch for a transplant. They collected 5,000 yellow perch in one afternoon. Very large schools of yellow perch were observed below the dam and anglers caught large numbers of perch below the dam in 1993.

Department biologists set a trap net below Cascade Reservoir dam in July 1993 to collect yellow perch for a transplant. The net was fished overnight and by morning was totally filled with fish. The total catch was estimated at 25,000 to 40,000 yellow perch, 178 mm to 203 mm.

After flows from Cascade Reservoir Dam were cut back to minimum in June 1993, landowners below the dam and adjacent to the river complained that the dead perch were so numerous that they created an intolerable stench. Department and United States Bureau of Reclamation personnel and county jail inmates removed thousands of dead yellow perch from the bank.

The Department received a phone call from Idaho Power Company personnel at the Cascade Reservoir Dam, in 1994. They had shut down the electricity generating turbines for maintenance and when they dewatered the draft tube the area below the turbines was one solid mass of yellow perch. They informed us that the fish filled an area equal to 54 cubic yards. We calculated that 54 cubic yards of yellow perch could be equal to 330,000 to 667,000 fish, 178 mm to 203 mm.

Fishery personnel in June 1995 contacted anglers harvesting yellow perch at a rate of about 20 fish per hour in the spillway forebay area. They also observed large balls of fish in the forebay area, apparently feeding on zooplankton.

The above numbers of yellow perch documented leaving the reservoir equals or exceeds the number of yellow perch estimated to be caught by anglers in years when intensive creel surveys were completed. The total number of yellow perch harvested by anglers from Cascade Reservoir in each of the years 1982, 1987, 1991 and 1992 was 399,000, 528,000, 50,000 and 182,000, respectively, illustrating the significance of the above numbers (Anderson et. al. 1987 and Janssen et. al. 1994).

The IDFG management goal for the Cascade yellow perch fishery is to maintain an annual yellow perch harvest that equals or exceeds the observed harvest of 400,000 fish during the 1980s.

Previously collected data also showed a cyclic yellow perch population in Cascade Reservoir with strong age classes produced in 1983 and 1984 and in 1989 and 1990 (Figure 1) (Janssen and Anderson 1994). These data suggested that the 1995 and 1996 age classes of yellow perch should have been the next strong contributors to the fishery. However, a large fish kill just after ice out in 1997 resulted in windrows of dead yellow perch, largescale suckers *Catostomus macrocheilus*, and Northern pikeminnow *Ptychocheilus oregonensis*. All dead yellow perch observed were very large specimens, 254 mm to 330 mm in length. There were very few yellow perch less than 254 mm observed, indicating that the 1995 and 1996 age class had failed.

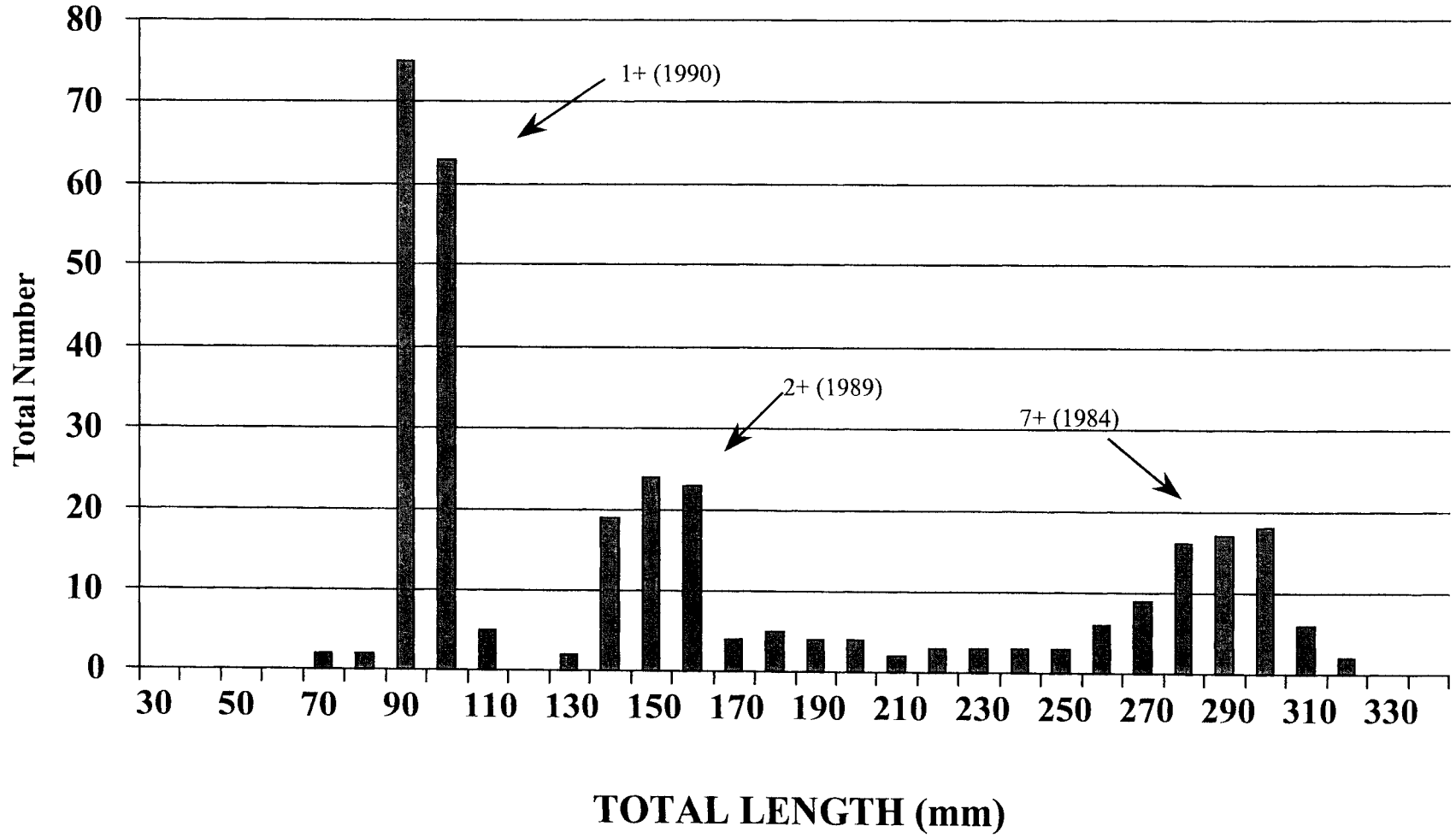

Figure 1. Cascade Reservoir yellow perch length frequencies, May 1991.

Due to the very large losses of yellow perch from Cascade Reservoir, poor yellow perch fishing, and an apparent void of strong age classes since 1990, we initiated investigations in 1998. These investigations were intended to determine the status of the yellow perch population in the reservoir, to determine the causes of the population decline and to identify possible remedies. These studies included the following objectives:

OBJECTIVES

1. Describe present yellow perch population structure in Cascade Reservoir. Establish trawling transects to monitor yellow perch population trends. Determine if a strong age class was produced in 1995, 1996 or later. We received significant funding from the U.S. Bureau of Reclamation and Idaho Power Company to conduct these investigations.

2. Monitor the extent, timing and significance of yellow perch entrainment.

3. Investigate perch migration and movement patterns within the reservoir to determine if and when fish are vulnerable to entrainment or environmental impacts.

4. Compare water quality and yellow perch distribution to determine if, when and why yellow perch vacate specific areas of the lake. Current literature suggest that yellow perch will move out of and avoid areas with less than 3 mg/l dissolved oxygen. (Suthers and Gee 1986).

5. Compare reservoir pool levels, water release timing, and water release rates and methods to changes in yellow perch populations.

6. Develop and implement solutions to factors causing negative impacts to yellow perch populations identified in these investigations

METHODS

Objective 1

The lake was divided into four areas (Figure 2) to equally distribute sampling effort and to define areas for the perch migration and movement study. An otter trawl was selected as the best gear type to collect and sample yellow perch with the least variation in catchability by size or age class. The otter trawl had a 4.9 m foot rope, 39 mm stretch mesh body and 13 mm mesh cod end. The net was pulled at a speed of 4.0 km/hour (Nielson 1983) for 10 minutes at each transect. A total of 13 trawling transects were selected from each area. Global Positioning Satellite (GPS) coordinates and the directional heading were recorded for each transect starting point.

All fish collected were counted, measured for total length and a representative sample of scales was collected to determine ages.

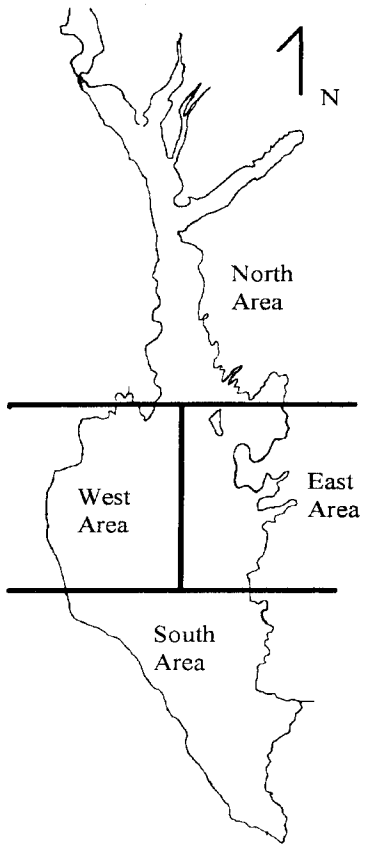

Figure 2. Fish sampling areas in 1998 on Cascade Reservoir.

Objective 2

We sampled the North Fork Payette River below Cascade Reservoir Dam just downstream of the Highway 55 bridge for emigrating yellow perch. This effort began in June 1998 and was repeated approximately every two weeks through October 1998.

We used an otter trawl with a 3.0 m foot rope, 39 mm stretch mesh body and 13 mm mesh cod end to collect emigrating yellow perch. The tow ropes and otter boards were removed from the trawl and replaced with two vertical spreader bars with two rings welded perpendicular to and at the top and bottom of the spreader bar. We selected a spot in the river approximately 1 m deep in the thalweg of the stream with a visually estimated minimum flow of 1.0 m/sec. We drove two steel fence posts into the stream bottom substrate approximately 2.5 m apart (the width of the fishing otter trawl). The trawl was attached to the posts by sliding the rings of the spreader bars (attached to the trawl) over and down the post to the bottom of the river. The net was set mid-morning, fished all day and checked at dusk; it was then reset, fished all night and pulled the following morning. All fish collected were counted and measured for total length.

Objective 3

Yellow perch collected during the trawling for Objective 1 were tagged with color coded, sequentially numbered T-Bar anchor tags. All yellow perch collected from a given area were tagged with the same color tag. Only yellow perch greater than 6 inches were tagged to avoid tag loss to predation. Tags would be recovered during future trawling efforts, during entrainment study sampling and from anglers. Total length, weight, tag number and color were recorded for each fish tagged.

Objective 4

We selected two locations where no yellow perch had and had not been collected with the trawl. Dissolved oxygen and temperature profiles were measured from surface to bottom at each site in July 1998.

Yellow perch catches were compared from identical trawling transects in June and August 1998. We chose one transect where yellow perch had been collected in June, but not in August, as well as one transect where yellow perch were collected in August, but not June. We also selected one transect where yellow perch were collected both in June and August and one transect where no yellow perch were collected in either June or August. Dissolved oxygen and temperature profiles were then measured at sunrise at each of the four sites the day after trawling was completed.

Objective 5

We plotted reservoir pool levels and water release rates through the dam by month from 1980 to present to identify any reservoir water management changes possibly related to changes in yellow perch population size and structure since 1990.

Objective 6

Factors causing negative impacts to the yellow perch population are yet to be identified, therefore work towards solutions has not yet begun.

RESULTS

Objective 1

We completed 141 trawling transects in 1998. We pulled the trawl for a total of 1,344 minutes collecting 439 yellow perch. We averaged 1.5, 1.8 and 6.8 yellow perch per 10-minute transect in June, August, and October, respectively. Age classes since 1990 were virtually absent.

Age 0 and age 1+ yellow perch dominated trawl catches. Only 10 yellow perch between 100 and 250 mm and nine greater than 250 mm were collected (Figure 3). In comparison the average catch per trawling transect in 1986 and 1987 was 73 and 94.5 perch with 74.5% and 95.7% respectively age 2+ and 3+ (Griswold and Bjornn 1989).

Yellow perch catch rates were generally higher in October with much higher variability. However the reservoir had turned over before trawling, eliminating anoxic conditions on the bottom. This mixing would allow yellow perch to use all of the bottom areas, releasing fish that may have been forced into mid water column areas due to low DO levels. Also, a larger percentage of the young-of-year yellow perch should have been large enough to be vulnerable to the trawl.

No statistical differences in average catch by area by month sampled were found (95% CI) (Table 2). Yellow perch length frequencies by area and month are presented in Figures 3-6. Catches per trawl transect were widely variable ranging from 0 to 85 yellow perch. Due to the large number of submerged stumps trawling in the north area was difficult and resulted in fewer numbers of transects being completed. We established 43 permanent transect sites (Table 3).

We collected a significant number of sick, moribund and dead, age 0 and 1 yellow perch in all three collection months and in all four sample areas. We also observed a high infestation rate of a white, 1-mm in diameter, encysted parasite. This organism was found randomly distributed throughout the musculature, on and around the gills, and on and around organs in the viscera. Cursory examination of yellow perch caught in the trawl in August and October revealed that 86% and 68% respectively had at least one cyst.

A sample of juvenile yellow perch from the June and August trawling catch were sent to the IDFG fish pathology lab. Lab personnel found a very high infestation rate of the protozoan *Trichodina sp.* and of a metacercaria of a larval digenetic trematode (white encysted parasite, species unidentified). Both parasites were found in numbers thought to be great enough to kill the host fish (Doug Munson, IDFG Fish Health Lab, personal communication).

Objective 2

We observed virtually no entrainment during the summer and fall of 1998. The trawl was fished a total of 83 daytime hours and 117 nighttime hours. We collected a total of one yellow perch during the day and two during the night. We also set a trap net below the dam on the first day and night we operated the trawl to determine if we were missing fish in the trawl. We collected a total of one yellow perch in the trawl and two yellow perch in the trap net. Yellow perch captured in the trawl measured 82, 129 and 200 mm.

Objective 3

We tagged a total of 11 yellow perch in 1998, two of which were collected in the south area, one in the east area, and eight in the west area. No yellow perch were tagged in the north area.

Table 2. Mean catch of yellow perch (95% CI) by area in June, August, and October 1998.

Sample Month	Mean Catch Rates (+/- 95% CI) By Area			
	South	East	West	North
June	0.6 (0.6)	1.3 (1.0)	2.2 (1.6)	1.5 (1.9)
August	0.2 (0.3)	1.2 (1.5)	1.2 (1.7)	9.6 (21.1)
October	8.6 (14.0)	8.1 (5.6)	7.9 (6.3)	2.7 (1.4)

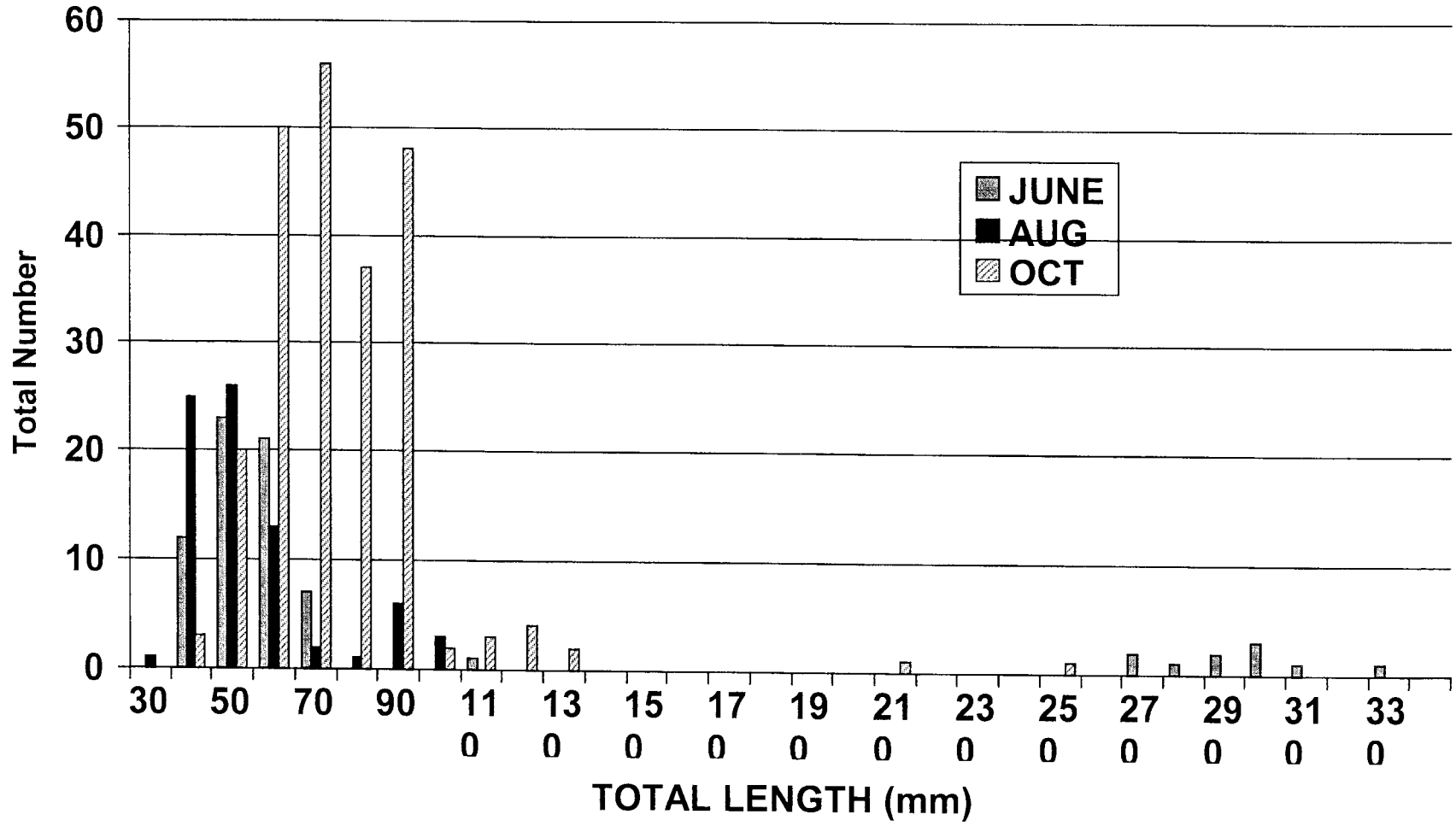

Figure 3. Length frequencies of yellow perch collected by trawl in 1998 by month in Cascade Reservoir.

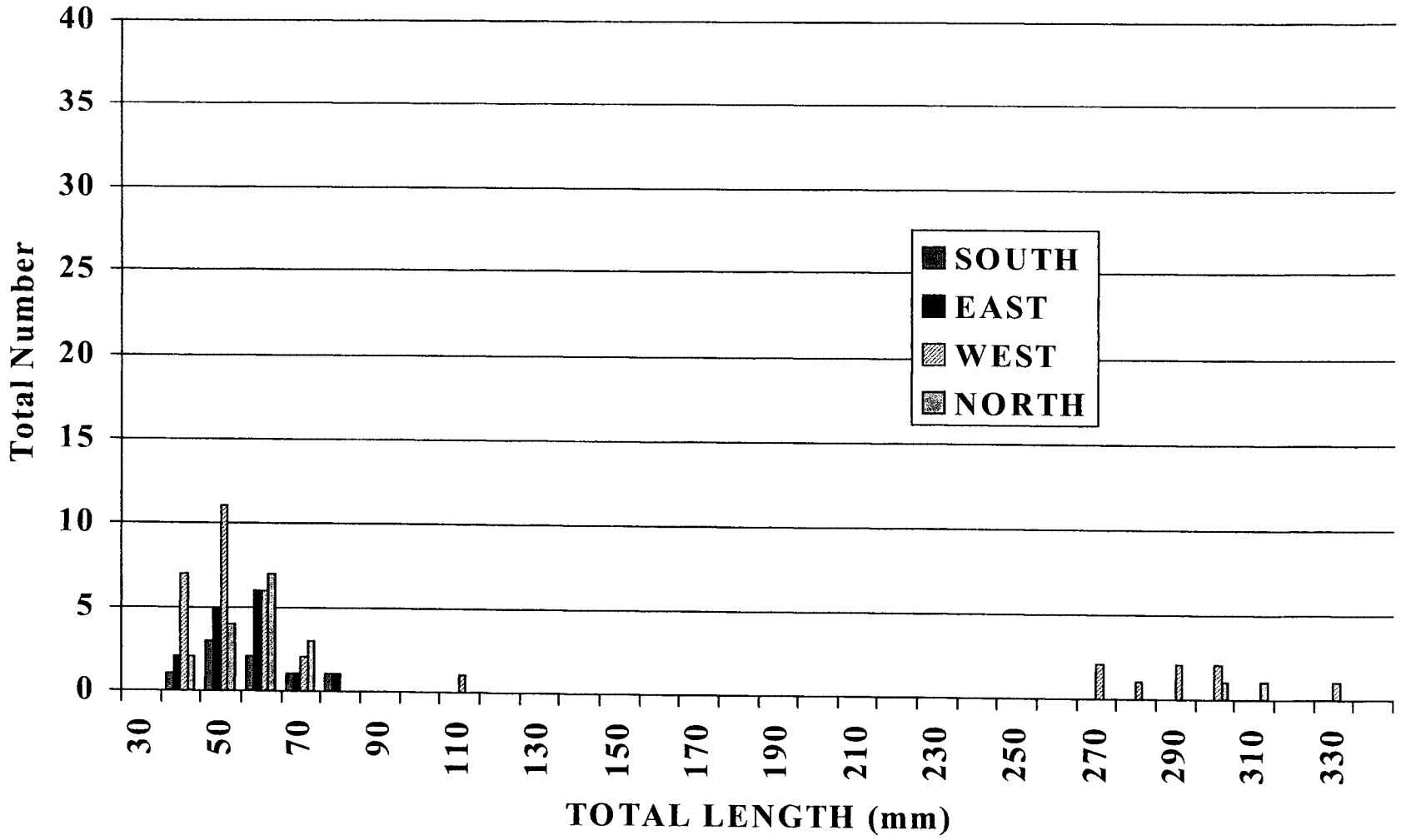

Figure 4. Length frequencies of all yellow perch collected by trawl in June 1998 by area in Cascade Reservoir.

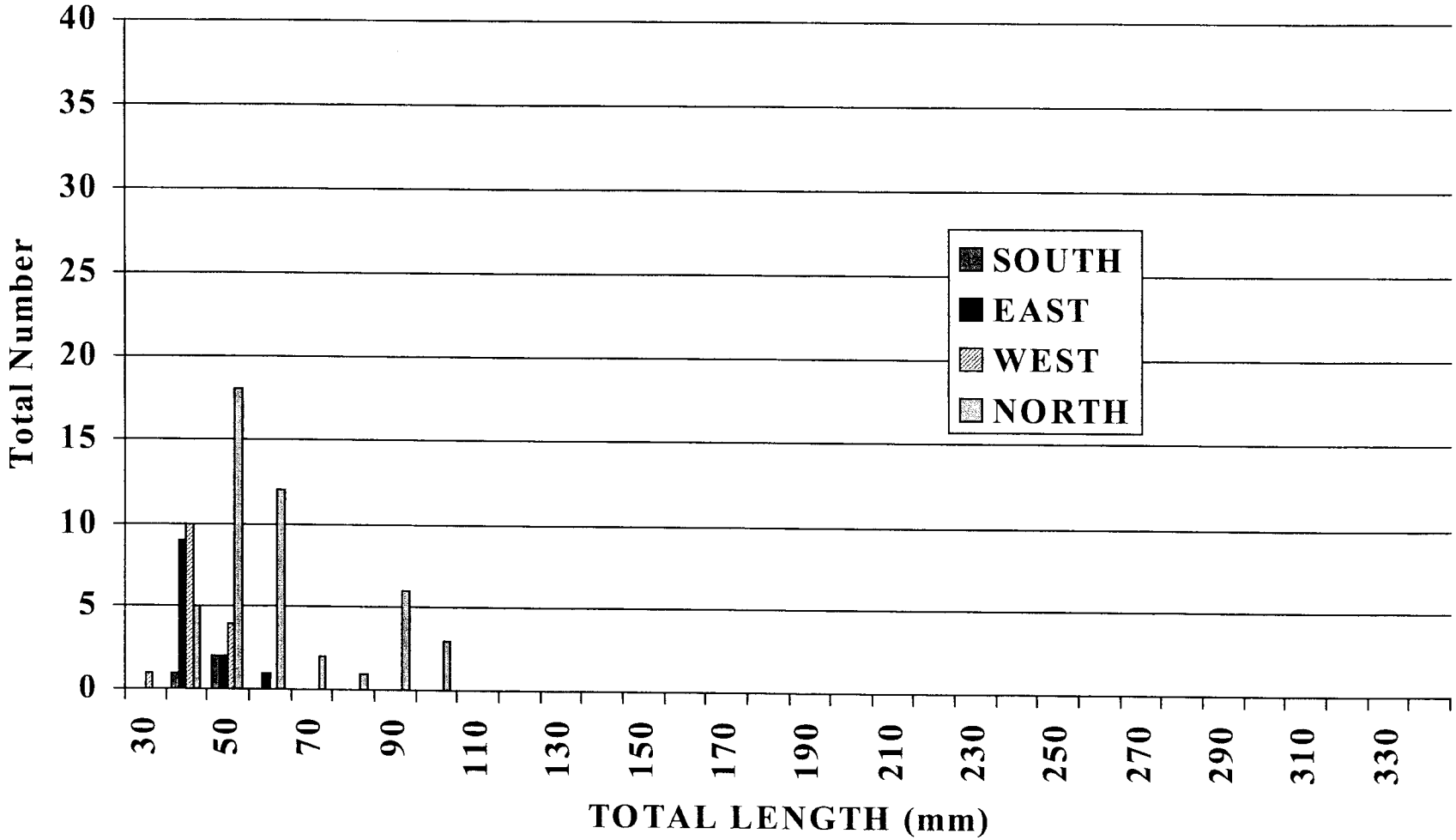

Figure 5. Length frequencies of all yellow perch collected by trawl in August 1998 by area in Cascade Reservoir.

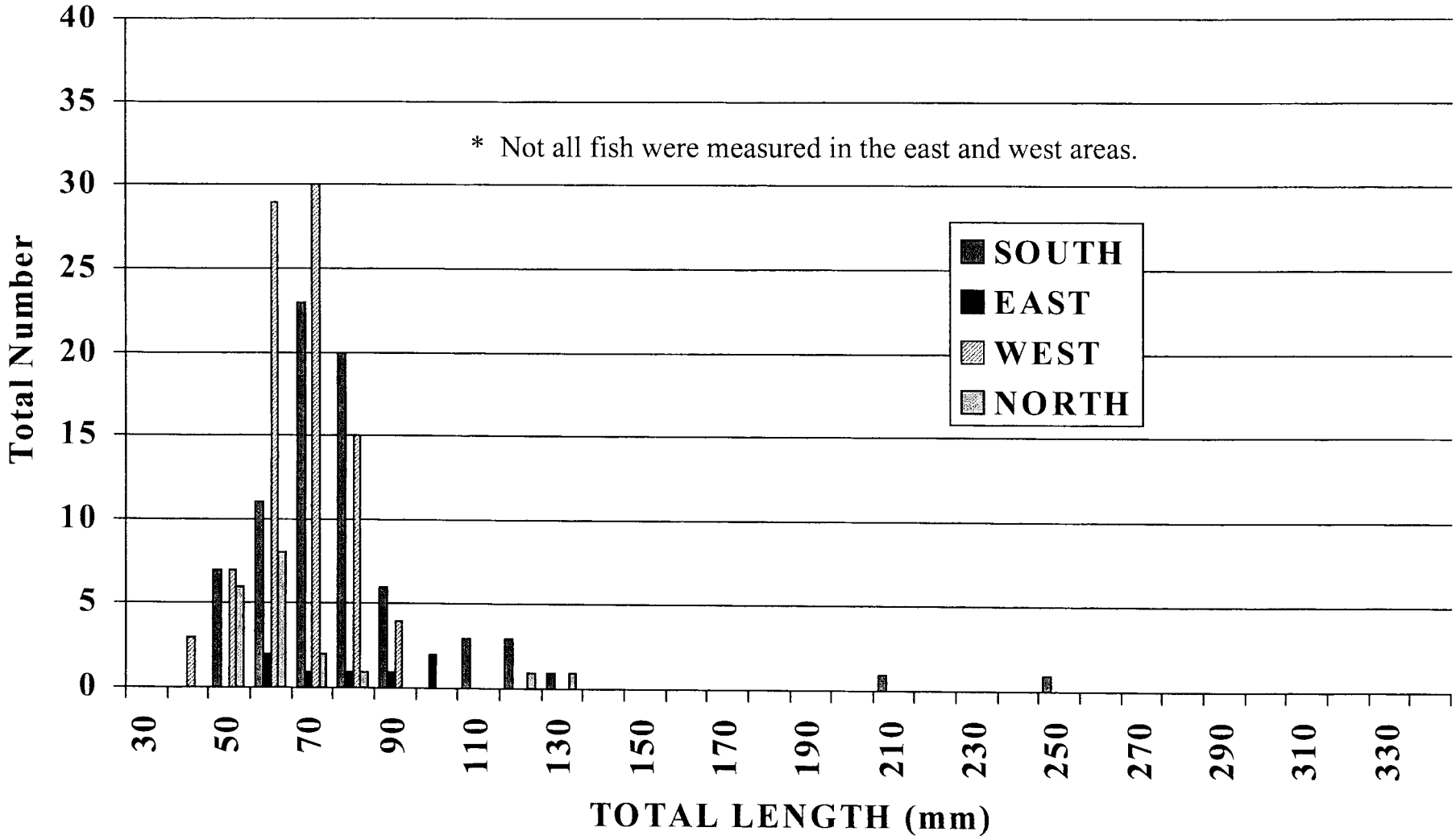

Figure 6. Length frequencies of all yellow perch collected by trawl in October 1998 by area in Cascade Reservoir.

Table 3. UTM coordinates and boat heading of beginning locations of trawling transects established Cascade Reservoir in 1998 (NAD 27 map Datum).

Transect Name	NAD 27 coordinates		Compass Heading	Transect Name	NAD 27 coordinates		Compass Heading
	UTM Easting	UTM Northing			UTM Easting	UTM Northing	
South Area (SS1)	0573829	4926265	0	East Area (ES1)	0574607	4937624	225
SS3	74990	26086	340	ES2	74132	34939	260
SS4	71879	27018	270	ES3	74396	35962	260
SS5	69626	23012	0	ES4	73662	37344	175
SS6	74460	28024	10	ES6	73190	38145	10
SS7	74666	28509	0	ES7	73536	38968	45
SS8	73348	28888	270	ES8	74091	37123	210
SS9	72206	28724	180	ES9	73732	39317	0
SS10	71531	30223	45	ES10	74213	36496	185
SS11	74445	31692	0	ES12	73989	35897	345
SS12	74649	32710	300	ES13	72708	39250	210
SS13	74052	33797	295	ES14	72350	36060	25
SS15	70263	32413	50	ES15	73310	37500	250
West Area (WS1)	71130	39887	220	North Area (NS1)	72767	40380	55
WS2	69545	39488	105	NS4	71034	40816	0
WS3	69023	38689	180	NS10	71539	49663	155
WS4	68041	37387	30	NS15	71000	49400	210
WS5	68528	37083	180				
WS6	67974	36174	75				
WS8	68392	35072	130				
WS10	68918	35442	110				
WS11	71246	37597	235				
WS13	68413	35196	10				
WS14	71000	35000	110				
WS15	69300	36000	45				
WS16	68500	34200	110				

Objective 4

We measured temperature and dissolved oxygen (DO) profiles on July 8, 1998 in the Cascade Golf Course, Campbell Creek, Cascade Christian Camp and Cabarton Bay areas. We collected yellow perch with the trawl in June 1998 in the church camp and golf course areas of the reservoir and found no yellow perch in the Campbell Creek and Cabarton Bay areas. Only the church camp area had dissolved oxygen levels below 5.0 mg/l (Table 4).

Table 4. Cascade Reservoir dissolved oxygen (mg/l) and temperature profiles measured at four sites on July 8, 1998 (*notes whether yellow perch were collected during the trawling in June at particular site).

Depth (m)	Campbell Creek (no perch)*		Cabarton Bay (no perch)*		Church Camp (perch)*		Golf Course (perch)*	
	DO	Temp	DO	Temp	DO	Temp	DO	Temp
0.0	7.4	22.5	7.2	23.0	8.12	23.0	7.35	22.8
1.0	7.4	22.0	7.3	23.0	7.9	20.0	7.4	22.0
2.0	7.6	21.5	7.4	22.0	7.9	20.0	7.4	21.5
3.0	7.9	19.0	8.2	20.0	7.9	18.0	7.3	21.0
4.0	7.2	17.0	--	--	7.9	17.5	6.7	18.0
5.0	6.6	16.5	--	--	7.5	17.0	6.5	16.0
5.5	6.4	16.0	--	--	--	--	--	--
6.0	--	--	--	--	6.3	17.0	--	--
6.2	--	--	--	--	4.0	17.0	--	--

We measured DO and temperature profiles at four transect locations on August 14, 1998, the day after finishing the August trawling. We collected four yellow perch in June and none in August at the WS5 transect. One yellow perch was collected in June and 40 in August at the NS16 transect. We collected five yellow perch in June and six in August in the ES4 transect and we collected no yellow perch in June or August at the SS12 transect. Dissolved oxygen levels had dropped to below 3.0 mg/l on the bottom at both the WS5 and SS12 transects (Table 5). Dissolved oxygen levels at the other two sites stayed at or above 3.0 mg/l for both sample periods.

Table 5. Cascade Reservoir dissolved oxygen (mg/l) and temperature profiles measured at four transects on August 14, 1998 (* number of perch collected in June/August).

Depth (m)	NS16 (1/40)*		WS5 (4/0)*		ES4 (5/6)*		SS12 (0/0)*	
	DO	Temp	DO	Temp	DO	Temp	DO	Temp
0.0	8.6	24.00	7.7	23.75	7.5	23.5	7.5	23.0
1.0	8.6	24.00	7.8	23.75	7.4	23.5	7.5	23.0
2.0	8.4	24.00	7.7	23.50	7.4	23.5	7.5	23.0
3.0	6.3	23.25	7.6	23.50	7.4	23.5	7.5	23.0
4.0	4.9	23.00	7.6	23.25	7.5	23.5	7.5	23.0
4.3	3.0	22.00						
5.0			7.6	23.00	7.5	23.0	7.5	23.0
6.0			7.0	22.00	7.2	23.0	7.6	23.0
7.0			2.2	20.50	7.0	23.0	5.6	20.5
7.2					6.3	22.5		
8.0							1.5	16.2
9.0							0.75	15.2
10.0							0.6	14.0
11.0							0.5	13.5
12.0							0.5	13.0
12.2							0.5	13.0

Objective 5

Flows in the North Fork Payette River fluctuate greatly from month to month and from year to year. No obvious changes were detected in outflow patterns since 1980 (Figure 7), particularly since 1991 when perch numbers began dropping (Figure 8).

We found reservoir pool elevations to be fairly consistent from year to year (Figure 9). Reservoir pool elevations have fluctuated approximately 19.7 ft, from a high of 4848.8 ft above mean sea level (msl) to a low of 4809.1 ft above msl in the past 19 years. No significant patterns in reservoir pool level management were found to explain the drastic drop in the yellow perch population and poor juvenile yellow perch survival since 1991. However, we noted that in January 1997, just prior to the large fish kill immediately after 1997 ice out, reservoir levels were at the second highest level (4,826' msl) in 19 years. The reservoir pool was drawn down to its lowest level (4,809' msl) in 19 years by March 1997. In all but three of the 19 years examined, the reservoir was being filled from January through March.

DISCUSSION

Suspected causes for the declining yellow perch numbers in Cascade Reservoir changed a great deal from our initial perception of the problem early in 1998. Emigration and entrainment appeared to be symptoms of a healthy yellow perch population and not the cause for declining numbers.

The yellow perch population in Cascade Reservoir was found to be severely depressed with few large fish (greater than 245 mm), virtually no age 2 to age 6 fish and severely depressed numbers of young-of-year and age 1 fish relative to numbers found in 1986 and 1987. Examination of yellow perch length frequencies in 1998 indicated that there had been virtually no survival of juvenile yellow perch since the strong 1989 and 1990 age classes. The cyclic nature of yellow perch in Cascade as described in 1991 (Janssen et al 1994) suggested that we should have expected strong age classes of yellow perch approximately every 5 to 6 years, or in 1994 and 1995. This has not occurred since 1990.

Additional anecdotal evidence suggested there were in fact strong age classes of small yellow perch through 1993. However these age classes probably did not recruit to preferred angler size due to predation by the strong 1989 and 1990 age classes. This has been documented to occur in other years following strong age classes of yellow perch (Janssen and Anderson 1994). These strong age classes consume virtually all the younger age classes for the next three years. Evidence also suggested poor juvenile yellow perch survival since approximately 1994 due to factors other than predation.

Midwater, suspended gillnetting in 1992 and 1993 collected large numbers of yellow perch in the 140 to 200 mm range. Juvenile yellow perch (age 0 and 1) were found in the stomachs of rainbow trout and kokanee collected in the nets, indicating good numbers of juveniles (IDFG data files).

Midwater, suspended gillnetting in late July 1994 collected good numbers of mid-size yellow perch and few trout. No juvenile yellow perch were found in trout stomachs. In late July 1994 there was an extensive and virtually total kill of trout and salmon in Cascade Reservoir due to warm water and low dissolved oxygen levels. Dissolved oxygen profiles in July showed levels below 3.0 ppm at the

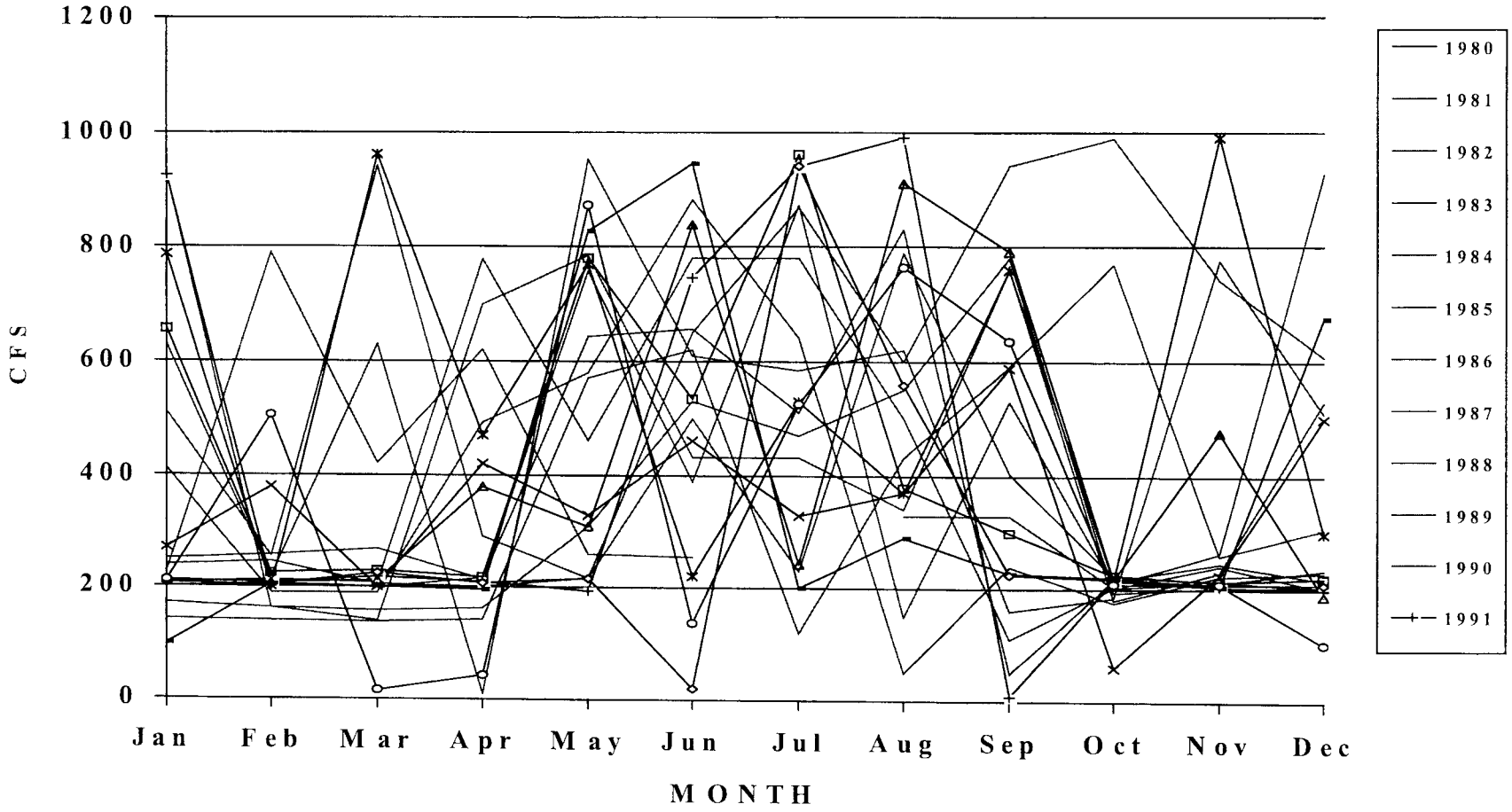

Figure 7. Cascade Reservoir dam releases (cfs) by month from 1980 through 1998.

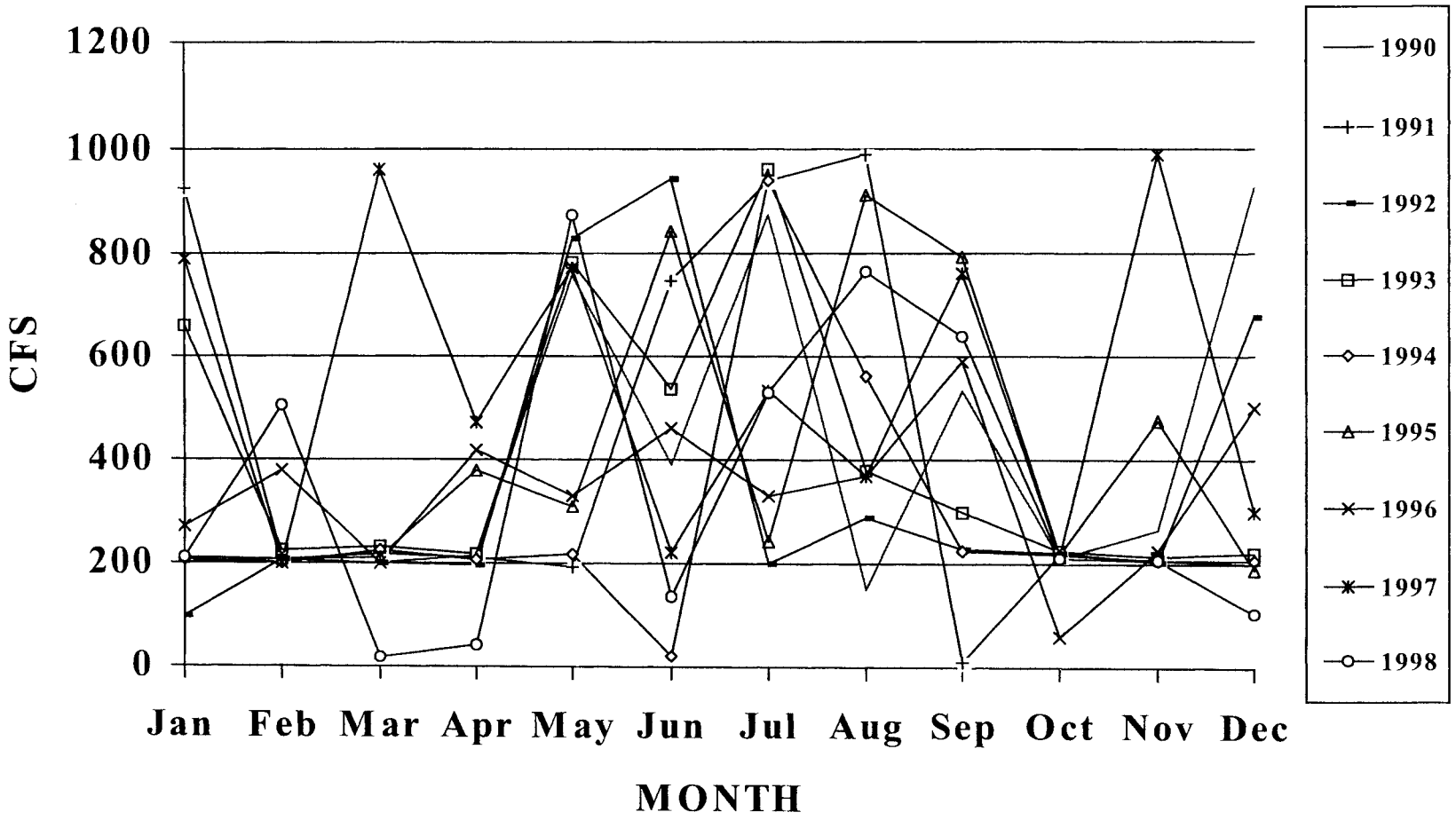

Figure 8. Cascade Reservoir dam releases (cfs) by month from 1990 through 1998.

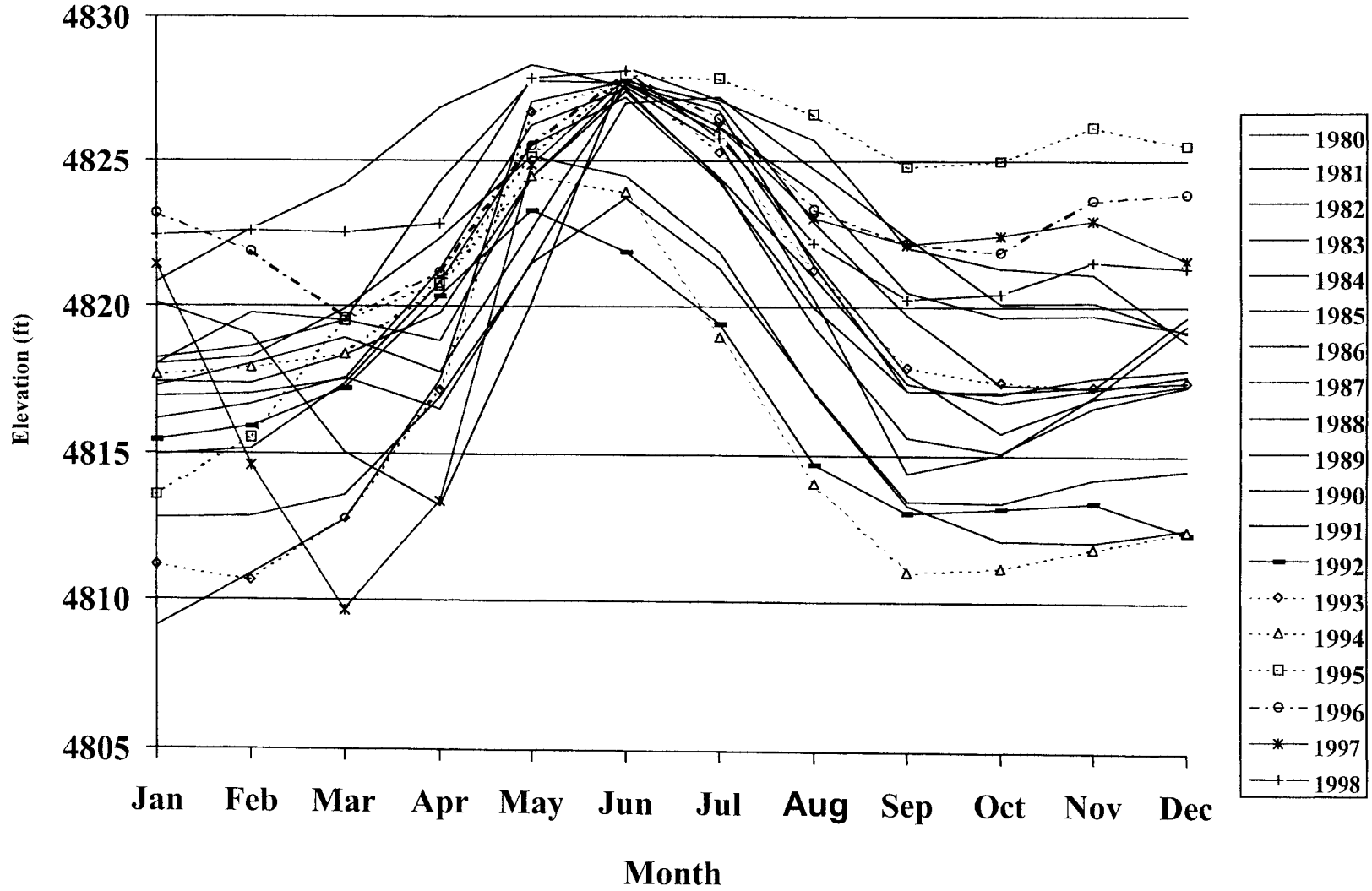

Figure 9. Cascade Reservoir elevations from 1980 through 1998.

shallowest depths ever recorded on Cascade Reservoir. There was also a significant yellow perch die off documented on July 26 when approximately 8 YOY (12-25 mm) yellow perch per m^2 were found dead and floating northwest of Sugarloaf Island.

In 1995 there was good yellow perch fishing for 229 – 280 mm fish, which were from the 1989-1990 age classes.

The large fish kill just after ice out in 1997 affected only very large (254–343 mm) yellow perch suggesting a lack of small and mid-size perch in the reservoir. This event also killed crayfish and mollusks.

In addition to the ice out kill there was a small fish kill of 38–50 mm yellow perch in the Cabarton area of the reservoir in late April 1997. Several fish were collected and sent the IDFG Eagle Fish Health Laboratory. Personnel diagnosed that factors contributing to cause of death were swollen hyperplastic gills with numerous aneurysms on secondary lamella and a heavy load of gill parasites indicating gill diseases resulting from poor environmental conditions. The bacteria (Pasteurella) was probably a facultative opportunist attacking a fish whose health was already compromised. Gill parasites identified included Gyrodactylus and Trichodinella (D. Burton, IDFG Eagle Fish Health Laboratory, personal communication).

The collection of sick, moribund and dead young-of-year and age 1 yellow perch in June, August and October of various years as well as significant fish kills documented in March, April, and July of various years suggests that environmental factors were playing a role in the demise of perch in Cascade Reservoir. Due to bottom DO levels of less than 3.0 ppm in late summer it appeared that yellow perch were being forced out of specific areas. Areas where we had collected yellow perch in May but none in July were the same areas with sufficient DO levels on the bottom in May but not in July. Fish were either leaving these areas or being driven up in the water column.

The heavy parasite loading on Cascade Reservoir yellow perch also appeared to be a symptom of water quality and/or other stresses. Conroy and Herman (1970) noted that *Trichodina sp.* rarely give rise to pathological manifestations of disease and are only sporadically found in living fish unless the fish is weakened in some way where the parasite can then multiply. They also noted that *Gyrodactylus* infections are almost always the result of keeping fish in bad conditions such as where metabolic by-products are allowed to accumulate. Wedemeyer et al. (1976) noted that Aeromonas and Pseudomonas hemorrhagic septicemia epizootics can be predisposed by protozoan infections such as *Trichodina* and or poor water quality conditions.

RECOMMENDATIONS

Further work is needed to determine and/or eliminate reasons for the demise of perch in Cascade Reservoir:

1. Efforts in 1999 should focus on water quality investigations in yellow perch habitat, as many of the above factors in the yellow perch decline appear to be water quality related. Determine if water quality problems in yellow perch habitat are unduly stressing perch making them more vulnerable to other diseases.

2. Positively identify the trematode metacercaria that infected the majority of the juvenile yellow perch in 1998.

3. Determine if food abundance is ever a problem for juvenile fish (both plankton and benthic invertebrates are important to juvenile yellow perch). Determine if the extremely severe anoxic conditions in 1994 eliminated large areas of benthic invertebrates.

4. Address the spawning potential of the existing adult yellow perch population. Adult yellow perch numbers are severely depressed and may not be numerous enough to produce a strong age class.

5. Document the fate of the 1999 age class of yellow perch.

6. Evaluate the potential of predation preventing recovery of the yellow perch population.

7. Continue the in-reservoir yellow perch movement study.

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1998 ANNUAL PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management

Project I: Surveys and Inventories

Subproject I-C: Southwest Region (McCall)

Job: c

Title: Rivers and Streams Investigations

Contract Period: July 1, 1998 to June 30, 1999

ABSTRACT

The 1998 kokanee *Oncorhynchus nerka kennerlyi* spawning run in the North Fork Payette River above Payette Lake was estimated to be 25,232 fish with a total biomass of 3,608 kg.

We completed a standard stream survey in Indian Creek, and we collected 27 bull trout *Salvelinus confluentus* for a population estimate of 270 +/-20 (95% CI) per mile of stream. No other fish were collected.

We surveyed Kennally Creek and Gold Fork River for the presence of Colorado River strain rainbow trout *O. mykiss*, which were experimentally stocked in 1995. None were collected. We collected a total of two rainbow trout, one brook trout *S. fontinalis* and 14 mottled sculpin *Cottus bairdi* in all three transects.

We worked with the Boise and Payette National Forests to survey the North Fork Kennally Creek and upper North Fork Gold Fork River for presence of bull trout. Snorkeling and electrofishing methods were used to survey mainstem and possible fish bearing tributaries. A resident population of bull trout was documented in one small tributary to the upper North Fork Gold Fork River. No bull trout were found in the North Fork Kennally Creek drainage. Other salmonids documented included rainbow trout, brook trout and cutthroat trout *O. clarki*. Distributions and abundance were documented.

We completed two fish sampling transects on the Middle Fork Weiser River, one transect on Mica Creek and two on Granite Creek. We collected rainbow trout from the lower Middle Fork Weiser River and Mica Creek and brook trout from Granite Creek and the headwaters of the Middle Fork Weiser River.

Three temperature recorders monitored the upper Little Salmon River drainage throughout summer. Mean daily river temperature peaked at 24.5°C in mid-July. A single temperature recorder in the North Fork of the Payette River, just below the confluence with Fisher Creek, at the USGS gauge, recorded temperatures throughout the summer. Average daily temperature remained below 20°C.

Snorkeling and electrofishing surveys were conducted in the Gold Fork River drainage in cooperation with the Boise and Payette National Forests. Distribution and abundance of salmonids were documented.

Anglers were guided by Wapiti Meadows Ranch Outfitters in a three-mile section of the South Fork Salmon River below the confluence with the Secesh River. All fishing was catch-and-release.

Steelhead/redband trout, cutthroat trout, and yearling chinook salmon *Oncorhynchus tshawytscha* were reported in the catch. Catch rates were 1.8 fish per hour.

Authors:

Paul Janssen
Regional Fishery Biologist

Kim Apperson
Regional Fishery Biologist

Don Anderson
Regional Fishery Manager

OBJECTIVE

To conduct investigations in rivers and streams to enhance, maintain, and protect McCall area fisheries.

INTRODUCTION

North Fork Payette River above Payette Lake

The spawning run of kokanee *Oncorhynchus nerka kennerlyi* in the North Fork Payette River (NFPR) from Payette Lake has been monitored since 1988 to assess spawning escapement and as a method of validating kokanee population, density and survival estimates from trawling (Janssen et al. 2000). This estimate was conducted again in 1998.

Indian Creek (Hells Canyon Reservoir Tributary)

Spruell and Allendorf completed a nuclear DNA analysis of bull trout *Salvelinus confluentus* from Indian Creek as part of an analysis of bull trout populations in Oregon State in 1997. We completed department standard stream surveys on Indian Creek in 1997 to determine the range of bull trout, redband trout *O. mykiss gairdneri* and brook trout *S. fontinalis*. We completed the Indian Creek survey in 1998, conducting one more survey transect above the Blue Jacket Mine road culvert. We also recorded spring, summer and fall water temperatures in the two main forks of Indian Creek just upstream of our fish and habitat survey transect.

Gold Fork River and Kennally Creek

We experimentally stocked 9,000 Colorado River strain rainbow trout *O. mykiss* into the Gold Fork River and 900 into Kennally Creek in July 1996. These fish had been marked with an adipose fin clip. Fish crews completed electrofishing surveys in these two streams in 1998 to determine the results of that stocking.

Middle Fork Weiser River and Tributaries

Department and US Forest Service personnel electrofished five transects on the Middle Fork Weiser (MFWR) River and its tributaries to determine fish species presence and abundance in this drainage.

Temperature Monitoring in Upper Little Salmon River and North Fork Payette River

The upper Little Salmon River drainage is the focus of ongoing riparian habitat improvement projects and some improvements in agricultural land use practice. Debate has risen regarding which specific factors limit salmonid populations within the drainage. The effect of high summer water temperature as a factor limiting salmonid abundance and distribution within the drainage is unknown. Temperature monitoring began in 1994.

During 1996, instream flows were modeled in the NFPR from Upper Payette Lake to below Fisher Creek. Results of that study were used to develop a summer instream flow recommendation to provide habitat for trout and kokanee (Payette Lake Technical Advisory Committee 1997; Big Payette Lake Water Quality Council 1998). Water temperatures will be monitored as part of the evaluation of the anticipated minimum instream flow water right.

Survey of Gold Fork River Drainage

The recent Problem Assessment for bull trout in the Gold Fork River (Idaho Division of Environmental Quality 1998) identified several tributaries where fish assemblages were not well documented but conditions appeared to be suitable for bull trout. We coordinated with the Boise and Payette national forests to survey these streams.

South Fork Salmon River Guided Fishery

Since 1994, Wapiti Meadow Ranch has guided catch-and-release fishing on a section of the South Fork Salmon River from Hamilton Creek to Threemile Creek, downriver from the confluence with the Secesh River. As part of their guiding permit the outfitter is required to report fishing effort and catch information annually to the Department. Annual reports will allow us to track trends in this fishery.

METHODS

North Fork Payette River above Payette Lake

We completed kokanee spawner counts by walking the entire stretch of river utilized by spawning kokanee and counting all live spawners. Multiplying the largest daily count by 1.73 gave the total spawning run estimate (Frost and Bennett 1994).

Indian Creek (Hells Canyon Reservoir Tributary)

In 1998 we completed a department standard stream survey on Indian Creek. The transect started 80 m below the low water road crossing and ended 80 m above the crossing (approximately 161 m below

the confluence of Indian Creek and Camp Creek) (Figure 1). We used electrofishing gear to sample fish in the transect. We made two passes, removing all fish collected each pass. All fish collected were identified to species, counted, weighed and measured.

Electronic temperature recorders were placed in two locations in the Indian Creek drainage. One recorder was placed in Camp Creek just upstream of its confluence with Indian Creek and the second recorder was placed in Indian Creek just upstream of the Camp Creek confluence.

Gold Fork River and Kennally Creek

We completed two electrofishing transects on Gold Fork River and one on Kennally Creek. The lowest downstream transect on Gold Fork was located 726 m downstream of the USFS boundary and the upstream transect was located just below the confluence of the north and south forks of Gold Fork River (Figures 2 and 3). The Kennally Creek transects were located just above the upper diversion on the Little Valley Ranch (Figure 4). All transects were 161 m in length. We completed two electrofishing passes at each transect. Fish collected were placed in live cages, identified to species, weighed and measured for total length and then released after both passes were completed.

Middle Fork Weiser River and Tributaries

We completed two fish sampling transects on the Middle Fork Weiser River (Figures 5 and 6), one transect on Mica Creek (Figure 7) and two on Granite Creek (Figure 8). The furthest downstream MFWR transect was located at the mouth of Warm Springs Creek and the upstream transect was located at the confluence of the two headwater forks of the MFWR. Transects were sampled making two electrofishing passes. All fish collected were removed and placed in live cages and kept separate by pass. All fish were identified, measured for total length, and weighed.

Temperature Monitoring on the Upper Little Salmon River and the North Fork of the Payette River

Three Hobo temperature recorders (Onset model HTI-5 to +35°C) monitored water temperature continuously in the Upper Little Salmon River, recording a temperature every 2.4 hours from June 19 through October 4, 1998. The upstream recorder, Station 1, was placed under the bridge on Hubbard Lane, approximately 500 m upstream from the irrigation diversion. Station 2 was approximately 50 m downstream from the Meadow Creek subdivision bridge adjacent to Highway 95, road mile 163.4 and at 45°N Latitude (Figure 9).

A recorder was placed in Mud Creek, a headwater tributary to the Little Salmon River, immediately below the confluence with Little Mud Creek under the Highway 95 bridge. This recorder operated from June 24 through October 4, 1998. A recorder was placed at the USGS gauging station in the North Fork Payette River below the confluence with Fisher Creek from June 18 through October 4, 1998.

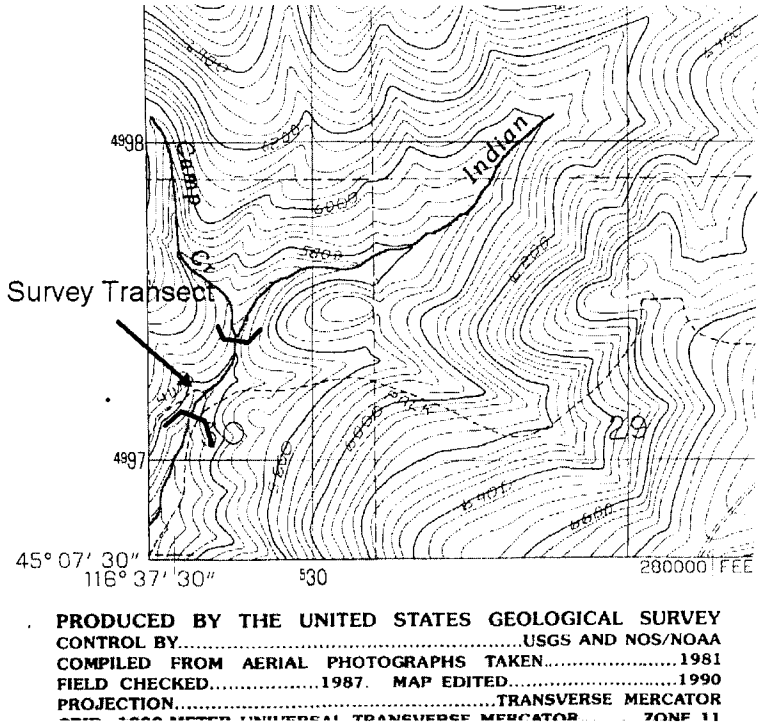

Figure 1. Stream survey transect site on Indian Creek above Blue Jacket Mine (Purgatory Saddle Quadmap).

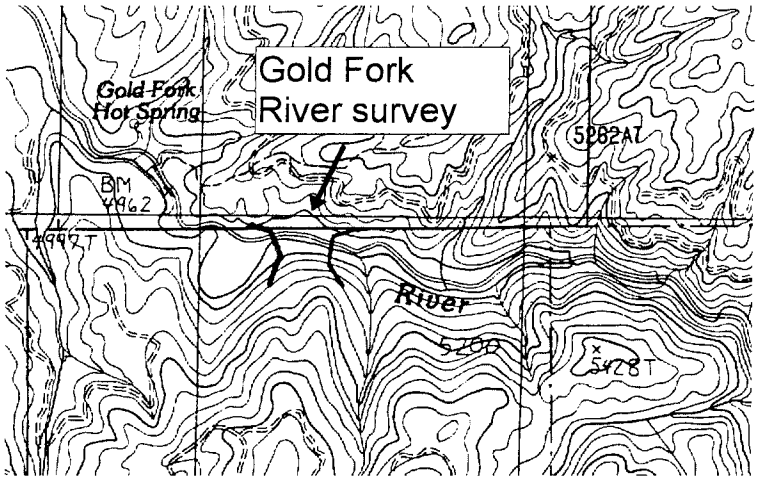

Figure 2. Lower Gold Fork River survey transect location (Sloans Pt. quad map).

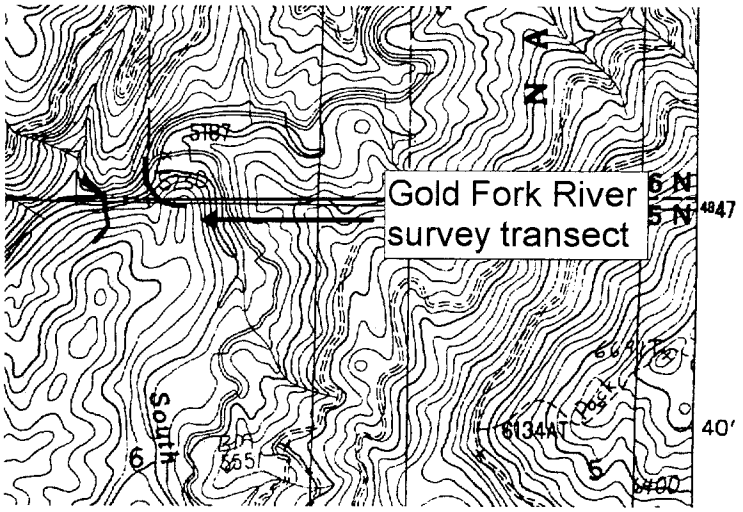

Figure 3. Upper Gold Fork River survey transect location (Sloan Pt. quad map).

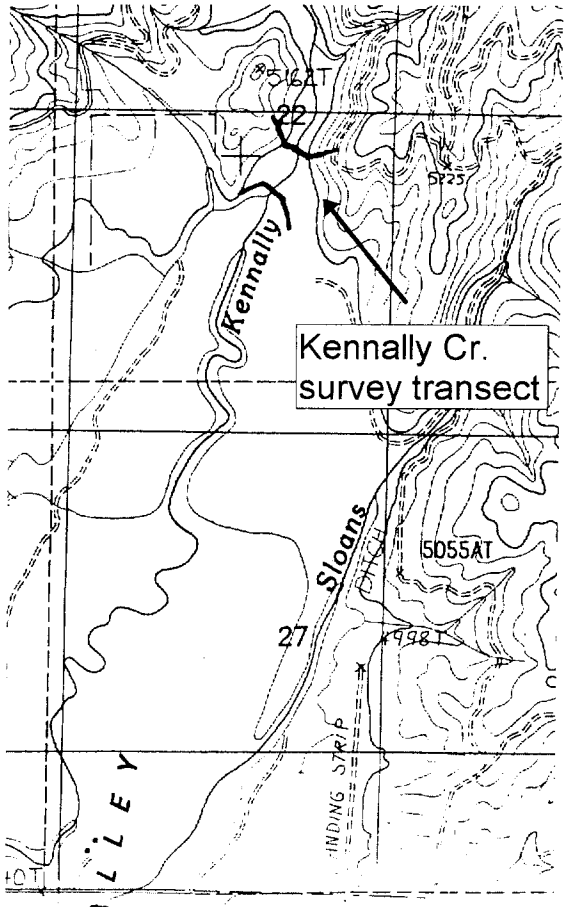

Figure 4. Kennally Creek survey transect location (Sloan Pt. quad map).

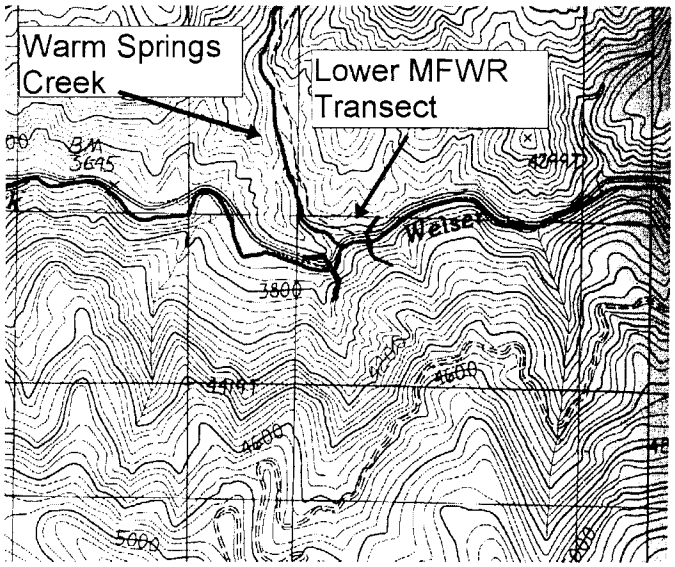

Figure 5. Lower Middle Fork Weiser River survey transect location at the confluence of Warm Springs Creek (Council Mt. quad map).

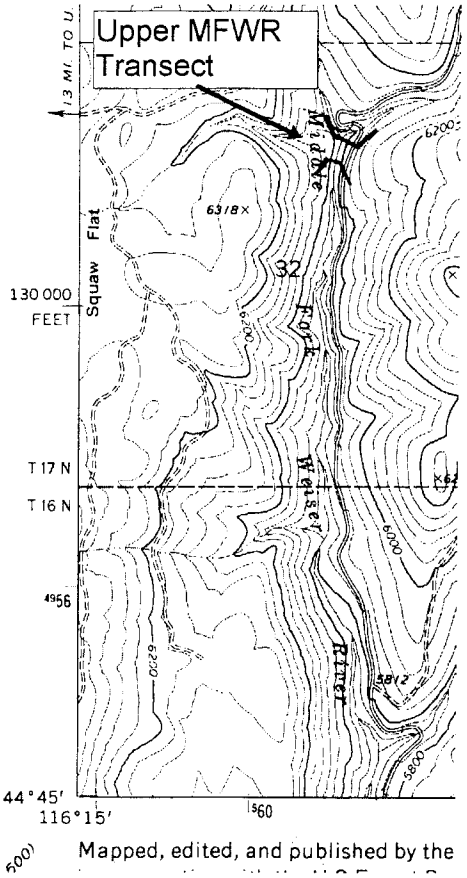

Figure 6. Upper Middle Fork Weiser River survey transect location (Lone Tree quad map).

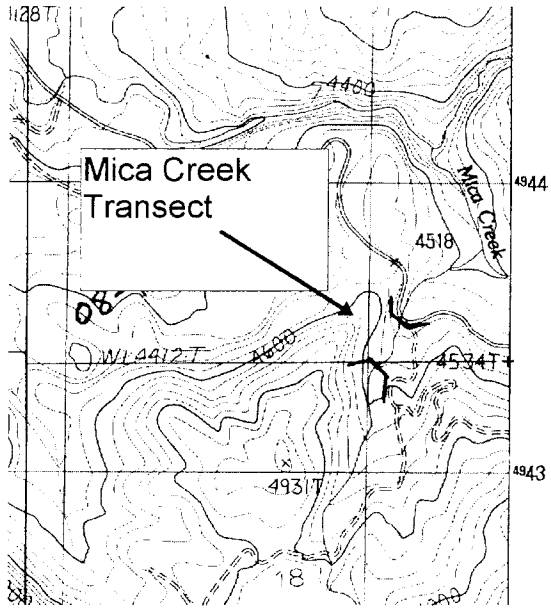

Figure 7. Mica creek survey transect location (Council Mt. quad map).

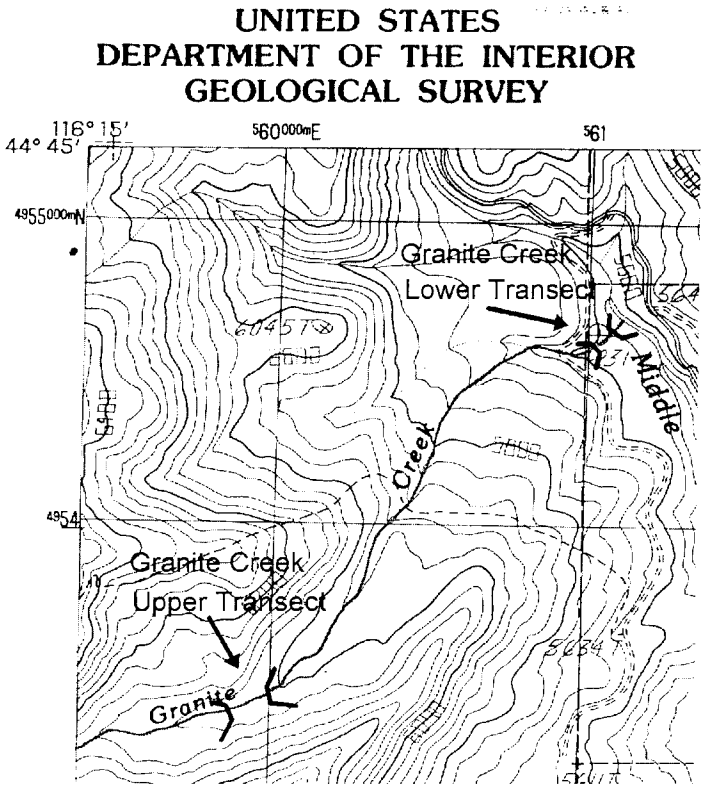

Figure 8. Granite Creek survey transect locations (Lone Tree quad map).

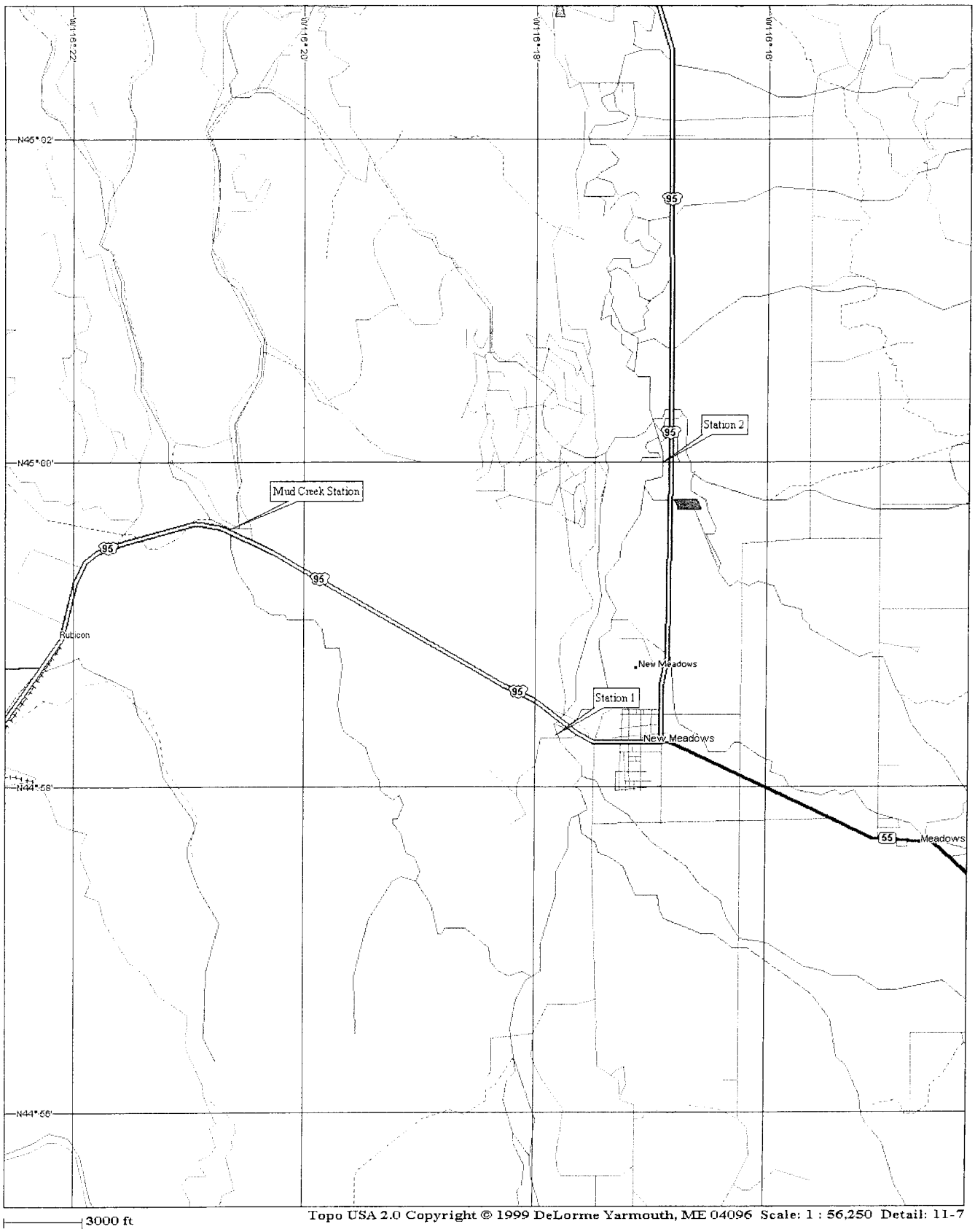

Figure 9. Location of temperature recorders in the Little Salmon River drainage, Idaho, 1998.

All recorders were in held in waterproof ABS containers and secured by cable or rebar to hold the recorder in the middle of the water column. Recorders were checked biweekly or monthly to maintain placement in the water column.

Survey of Gold Fork River Drainage

On July 16-17, 1998 a reconnaissance survey of Rapid Creek and North Fork Kennally Creek was conducted in cooperation with the Payette National Forest. Snorkeling and hook and line sampling were conducted on these streams and major tributaries to document salmonid distribution. Water temperatures were measured. On July 22-24 crews returned to Kennally Creek to conduct quantitative snorkel surveys in both representative stream reaches and in reaches determined most likely to support bull trout.

On July 20 a reconnaissance survey of upper North Fork Gold Fork River and two of its tributaries was conducted by snorkeling to document salmonid distribution. On July 21 crews returned to representative reaches of the streams and either snorkeled or electrofished to collect quantitative fish abundance, size, and habitat information. Figures 10 and 11 show locations of surveys throughout the Gold Fork River drainage.

South Fork Salmon River Guided Fishery

Idaho Department of Fish and Game provided Wapiti Meadows Ranch with angler diaries specifically for monitoring this fishery. Guides were asked to have clients record time fished, species caught, and fish length to the nearest inch. There was also space provided for comments and an opportunity for the angler to have his or her diary returned after analysis.

RESULTS

North Fork Payette River above Payette Lake

We made a peak kokanee spawner count of 14,585 live fish on September 16, 1998 (Table 1). The total spawning run estimate including those trapped was 25,232 fish. Average fork length of post-spawned fish was 234 mm and 237 mm for males and females, respectively. The average weight of mature, green fish was 143 g (males 142 g, females 144 g).

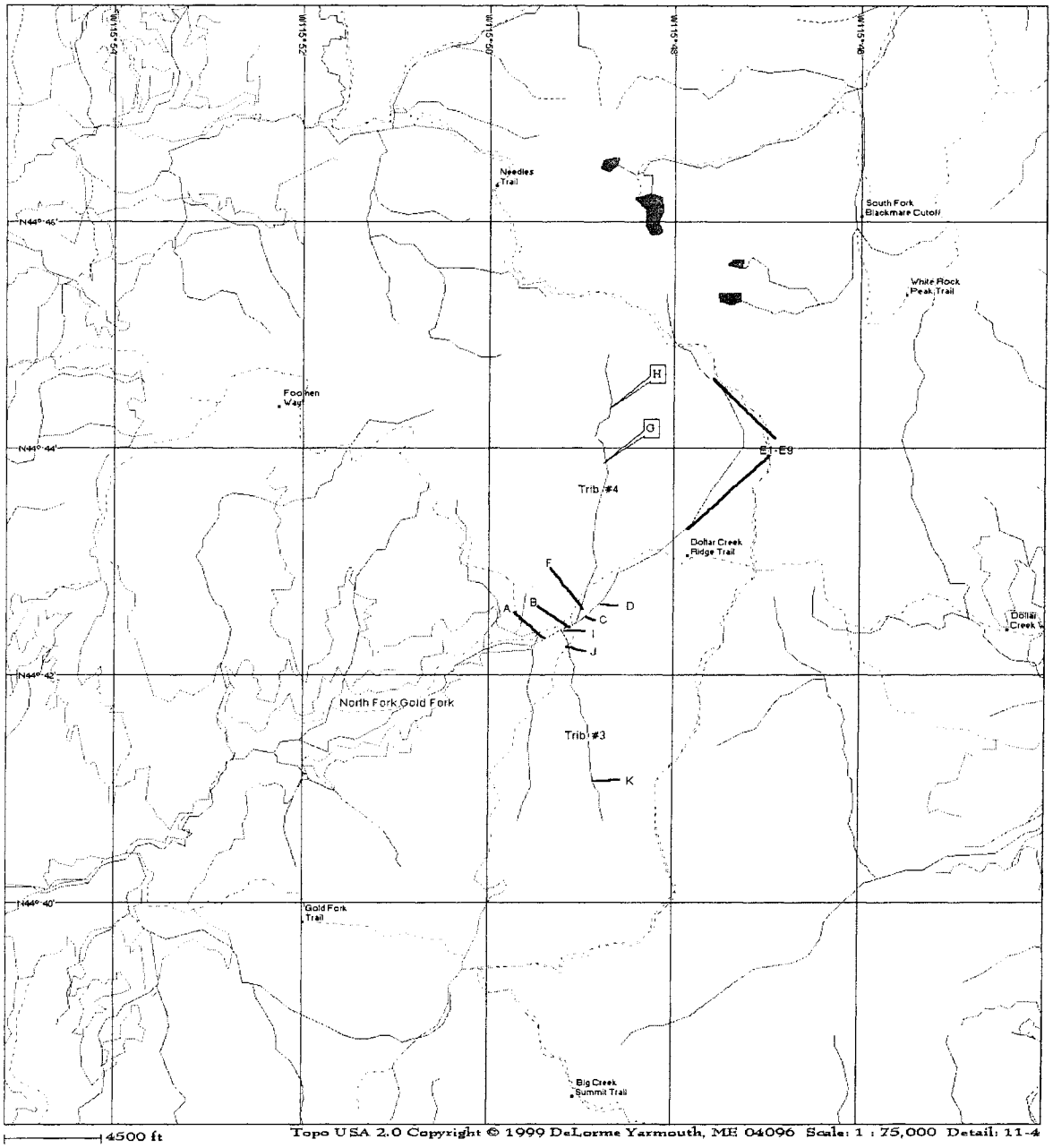

Figure 10. Locations of surveys in the Gold Fork drainage to determine presence and distribution of bull trout, July 1998. Refer to Tables 6 and 7 for exact site locations and habitat characteristics.

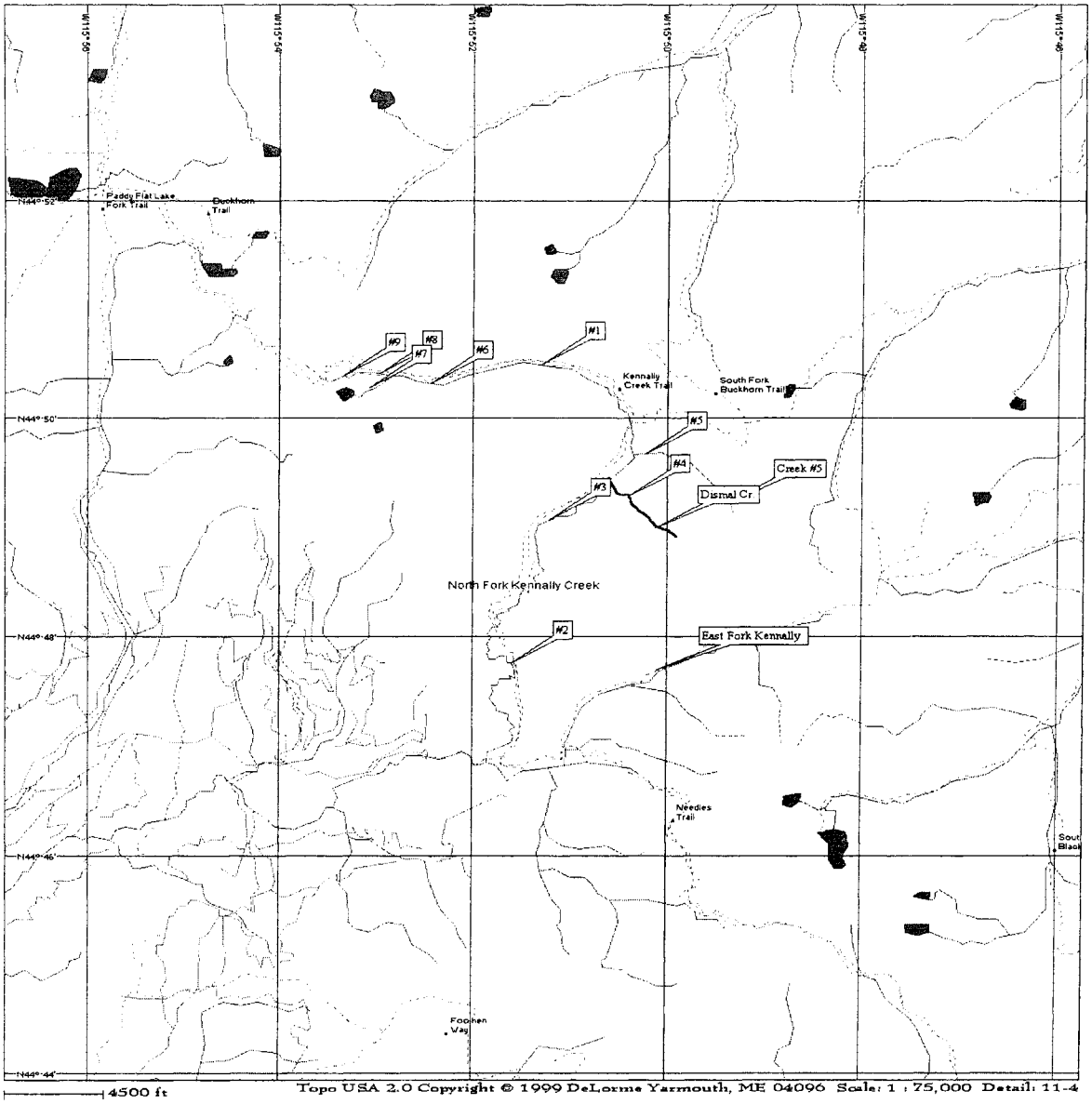

Figure 11. Locations of surveys in the Kennally Creek drainage to determine presence and distribution of bull trout, July 1998. Refer to Tables 8 and 9 for exact site and habitat characteristics.

Table 1. Estimated total kokanee spawning run size and biomass from 1988 through 1998 for Payette Lake (1,715 ha usable kokanee depth [> 40 ft]).

Year	Peak count	Estimated # spawners	KG/HA	Number/HA	Average weight (g)
1988	13,200	22,800	4.6	13.3	346
1989	8,400	14,500	2.9	8.4	349
1990	9,642	16,700	3.5	9.7	358
1991	10,400	18,000	5.3	10.5	505
1992	16,945	29,300	6.4	17.1	377
1993	34,994	59,310[a]	8.5	34.6	245
1994	25,550	44,200	5.5	25.8	214[b]
1995	32,050	55,450	4.8	32.3	147
1996	35,090	60,707	5.7	35.4	162[c]
1997	36,300	64,891[d]	5.6	37.8	148
1998	14,585	25,232	2.1	14.7	143

[a] Estimate made from stream and weir counts (Frost and Bennett, 1994)
[b] From gill net data of captured spawners in Payette Lake during lake survey.
[c] From trawling collections made in September 1996.
[d] Includes 2,092 females trapped and spawned by Nampa Fish Hatchery.

Indian Creek (Hells Canyon Reservoir Tributary)

We collected 24 bull trout on the first pass and three on the second pass for a population estimate of 270 +/-20 fish (95% CI) per mile of stream. The bull trout population was made up of small and probably resident fish with sizes and weights ranging from 103 mm and 8 g to 202 mm and 78 g (Table 2). No other fish species were collected although brook trout and bull trout x brook trout hybrids have been observed in this section of stream in the past (Spruell and Allendorf 1997).

Indian Creek averaged 6.9 meters in width with a bottom substrate predominantly of rubble and boulder (Appendix A). Water temperatures were very cold in both forks averaging approximately 9°F. during the summer highs (Figures 12 and 13).

Table 2. Length frequencies, average weight, and average condition factors (Ktl) of bull trout collected from Indian Creek on August 8, 1998.

Total Length (mm)	Indian Creek - Bull Trout		
	Total Number	Average Weight	Condition (Ktl)
100	1	8	.73
110	0		
120	1	16	.84
130	4	20	.84
140	2	23	.79
150	1	34	.86
160	2	36	.79
170	4	52	.97
180	3	53	.85
190	5	66	.90
200	2	73	.88
210	2	99	.87
220	0		

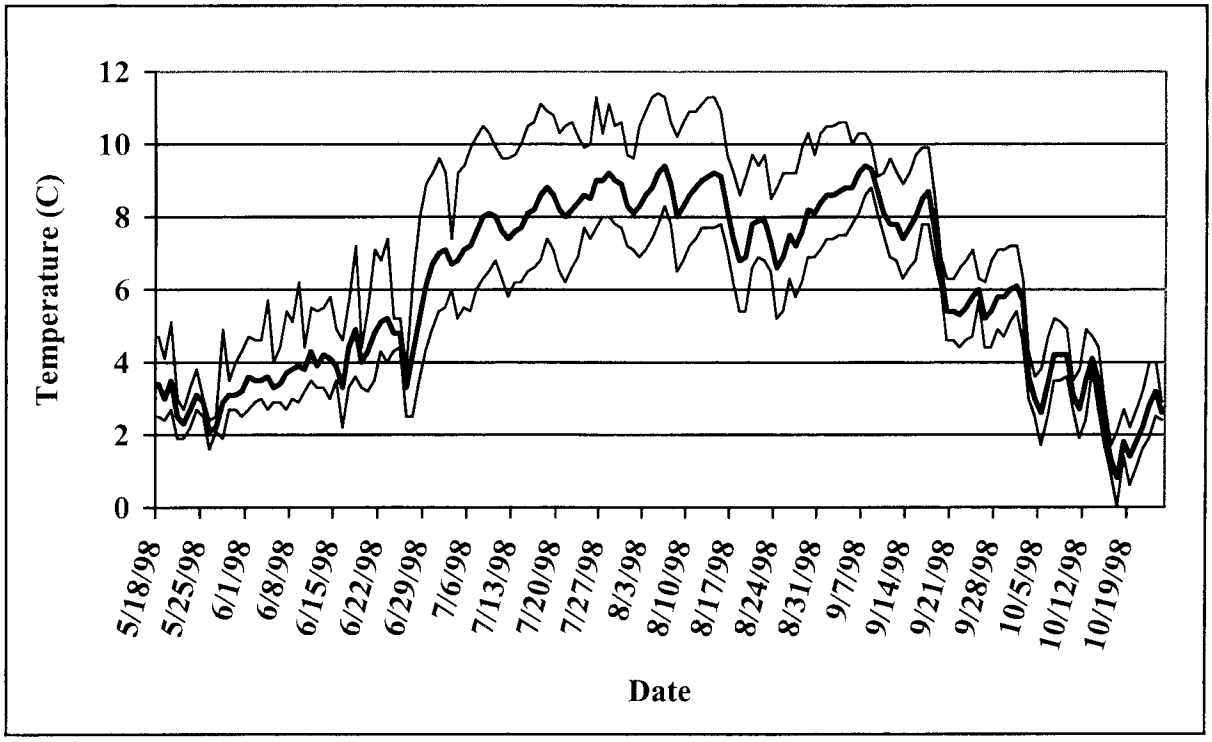

Figure 12. Average daily, minimum and maximum temperatures (C) for Indian Creek just upstream of the Camp Creek confluence.

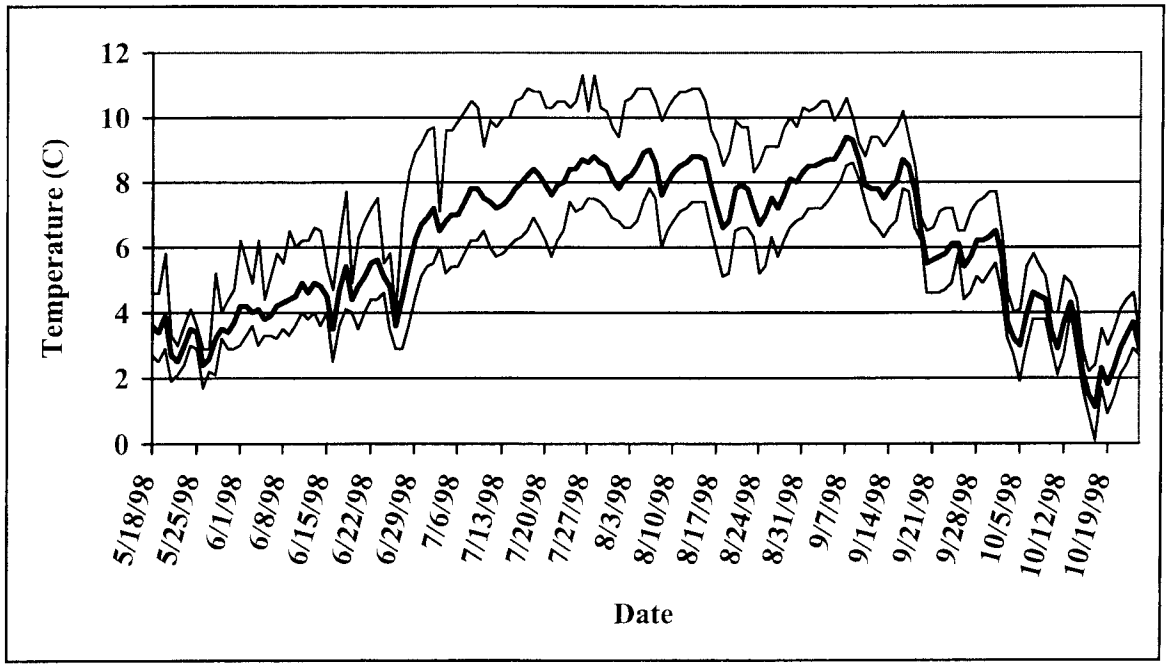

Figure 13. Average daily, minimum and maximum temperatures for Camp Creek just upstream of confluence with Indian Creek.

Gold Fork River and Kennally Creek

We found Kennally Creek and the Gold Fork River to be virtually fishless. None of the marked Colorado River strain rainbow trout were collected. We collected no trout and four sculpin *Cottus spp.* at the Gold Fork transect just below the North and South Fork confluence. We collected two rainbow trout of 152 mm and 123 mm, one brook trout of 164 mm and three sculpin at the Gold Fork transect .47 miles downstream of the USFS boundary. We collected two rainbow trout of 86 mm and 144 mm and seven sculpin from Kennally Creek.

Middle Fork Weiser River and Tributaries

We found that the lower Middle Fork Weiser River and Mica Creek fishery consisted primarily of wild rainbow trout. Population estimates were 956 and 310 rainbow trout per km, respectively (Table 3). We also collected a small number of stocked catchable size rainbow trout. The fishery in Granite Creek and in the headwaters of the MFWR was virtually all brook trout. Length frequencies and condition of all fish collected are presented in Table 4.

Table 3. Population estimates by species in each Middle Fork Weiser River, Granite Creek and Mica Creek transect in 1998.

Transect Site	Transect Length (m)	Fish Species	Estimated #/transect +/- 95% CI	Estimated #/km of stream +/- 95% CI
MFWR @ Warm Springs Cr.	161	Rainbow trout (wild)	154 +/- 32	956 +/- 198
MFWR @ Warm Springs Cr		Mountain Whitefish	10 +/- 3	62 +/- 19
MFWR @ Warm Springs Cr		Rainbow trout (hatchery)	5 +/- 2	31 +/- 12
MFWR headwaters	81	Brook	53 +/- 16	658 +/- 199
Mica Creek	81	Rainbow trout (wild)	25 +/- 3	310 +/- 37
Granite Creek (upper)	161	Brook	81 +/- 9	503 +/- 56
Granite Creek (lower)	161	Brook	37 +/- 8	230 +/-50

Table 4. Length frequencies, average weight, and average condition factors (Ktl) of rainbow trout and relative weights (Wr) of brook trout collected from the Middle Fork Weiser River and tributaries on October 14, 1998.

Total Length (mm)	Stream (species)														
	MFWR Warm Springs (wild rainbow trout)			MFWR Headwaters (brook trout)			Granite Creek lower (brook trout)			Granite Creek upper (brook trout)			Mica Creek (rainbow trout)		
	#	Ave. weight (mm)	Ktl	#	Ave. weight (mm)	Wr	#	Ave. weight (mm)	Wr	#	Ave. weight (mm)	Wr	#	Ave. weight (mm)	Ktl
40													4	--	--
50	2	2	1.29	3	1.3	72.9	1	--	--	9	--	--	1	--	--
60	2	3	1.06	4	1.7	59.5	9	--	--	20	2	75.0	0		
70	5	3.8	092	0			7	2.7	39.2	6	3	77.1	3	3.3	0.74
80	1	5	0.98	1	6	84.9	4	4.7	61.0	1	--	--	3	3.5	0.63
90	1	7	0.84	4	8	86.1	0			1	7	70.3	4	8.75	1.02
100	6	10	0.90	3	10	71.0	2	10.5	81.0	12	11	84.8	0		
110	23	13	0.90	0			2	13	77.2	6	15	81.5	5	12.4	0.84
120	16	17	0.92	4	20	88.9	3	17	82.6	5	17	79.5	0		
130	13	22	091	8	22	79.1	1	--	--	2	23	78.7	1	22	0.89
140	8	26	0.87	2	31.5	84.7				2	29	76.1	0		
150	8	32	0.90	5	36	84.5				2	29.5	69.2	0		
160	10	36	0.86	6	40	78.3				0			1	40	0.92
170	6	48	0.93	1	55	87.6				4	50	74.5	1	44	0.89
180	6	55	0.90	1	51	68.1				0			0		
190	5	65	0.92	1	63	73.6				3	65	74.5	0		
200	4	77	0.90	1	68	66.7				1	77	76.7	1	86	0.97
210	4	92	0.96							1	85	72.7			
220	2	108	0.99												
230	0														
240	0														
250	1	143	0.85												

Temperature Monitoring on the Upper Little Salmon River and the North Fork of the Payette River

In the Little Salmon River, average daily temperature for June ranged from 12.0°C to 17.4°C (Figure 14; Appendix A). Average daily temperatures for July ranged from 16.1°C to 24.5°C. Average daily temperatures for August ranged from 16.2°C to 22.3°C. Average daily temperatures in September ranged from 12.4°C to 19.6°C. Temperature exceeded 20°C for >6 hours on 62 of 109 days at both Station 1 and Station 2.

In Mud Creek, average daily temperatures for July ranged from 15.2°C to 22.6°C (Figure 14; Appendix A). Average daily temperature for August ranged from 15.9°C to 21.3°C. September average daily temperature ranged from 11.5°C to 19.5°C. Maximum daily temperatures exceeded 20°C for >6 hours on 68 of 103 days.

The North Fork Payette recorder monitored daily water temperatures from June 18 to September 11, at which time the recorder was disturbed by campers (Figure 15; Appendix B). The recorder was repositioned on September 15 and monitored water temperature until October 4. Average daily temperature for June ranged from 6.4°C to 12.3°C. Average daily temperature for July ranged from 13.2°C to 19.8°C. August daily average temperature ranged from 15.1°C to 19.8°C. Average daily temperatures in September ranged from 10.6°C to 16.9°C. Maximum daily temperature exceeded 20°C for >6 hours on 32 of 109 days throughout the recording period.

Survey of Gold Fork River Drainage

One previously unsurveyed tributary (Trib #3 on Figure 10) to the upper North Fork Gold Fork River had abundant resident bull trout (Table 5). The other tributary surveyed (Trib 4) contained low numbers of rainbow trout (Table 6). The mainstem of the upper North Fork Gold Fork River, from Forest Road 402 to Trail 114 crossing supports bull trout and redband trout ranging from 0.5 to 2.1 fish/100 m^2 (Table 6). No fish were observed upstream from the trail crossing though habitat was in good condition (Table 7).

No bull trout were observed in the North Fork Kennally Creek drainage (Tables 8 and 9). Cutthroat trout *Oncorhynchus clarki* and redband trout were found in the tributary headwaters downstream from Kennally Lakes, and in the upper main North Fork (sites 6, 8 and 9 on Figure 11). No fish were observed in the southern headwater tributary (site 7). Further downstream in the North Fork brook trout were abundant, with redband trout observed very infrequently. Only brook trout were observed during quantitative surveys in the downstream reach.

South Fork Salmon River Guided Fishery

We received information from guided trips that took place from July 29 through September 4. Steelhead/redband trout, westslope cutthroat trout *O. clarki lewisi*, and one yearling chinook salmon *O. tshawytscha* were reported in the catch (Table 10). Catch rate for all species combined was 1.8 fish/h in the South Fork Salmon River. Steelhead/redband trout dominated the catch in 1998.

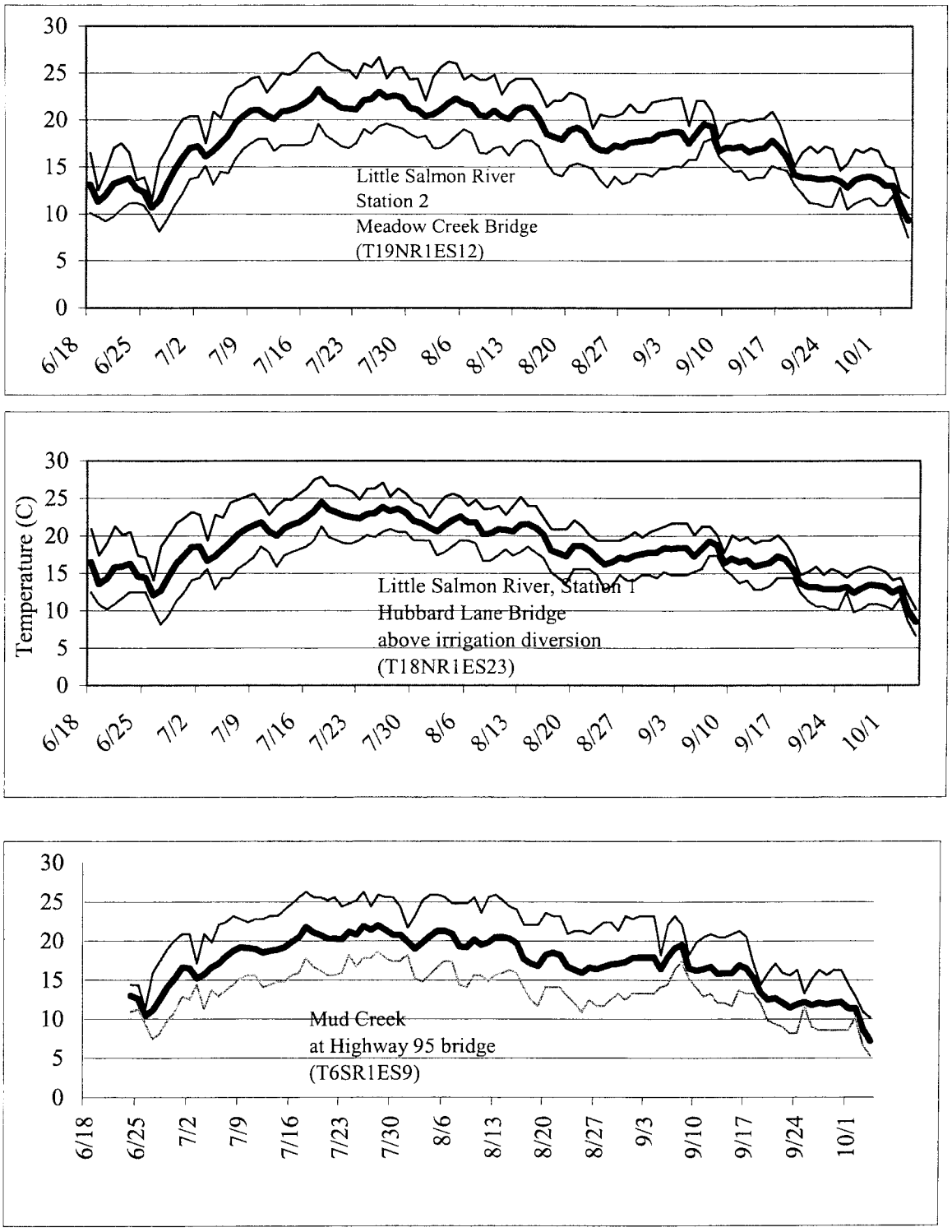

Figure 14. Mean, maximum, and minimum daily water temperatures in the upper Little Salmon River drainage, 1998.

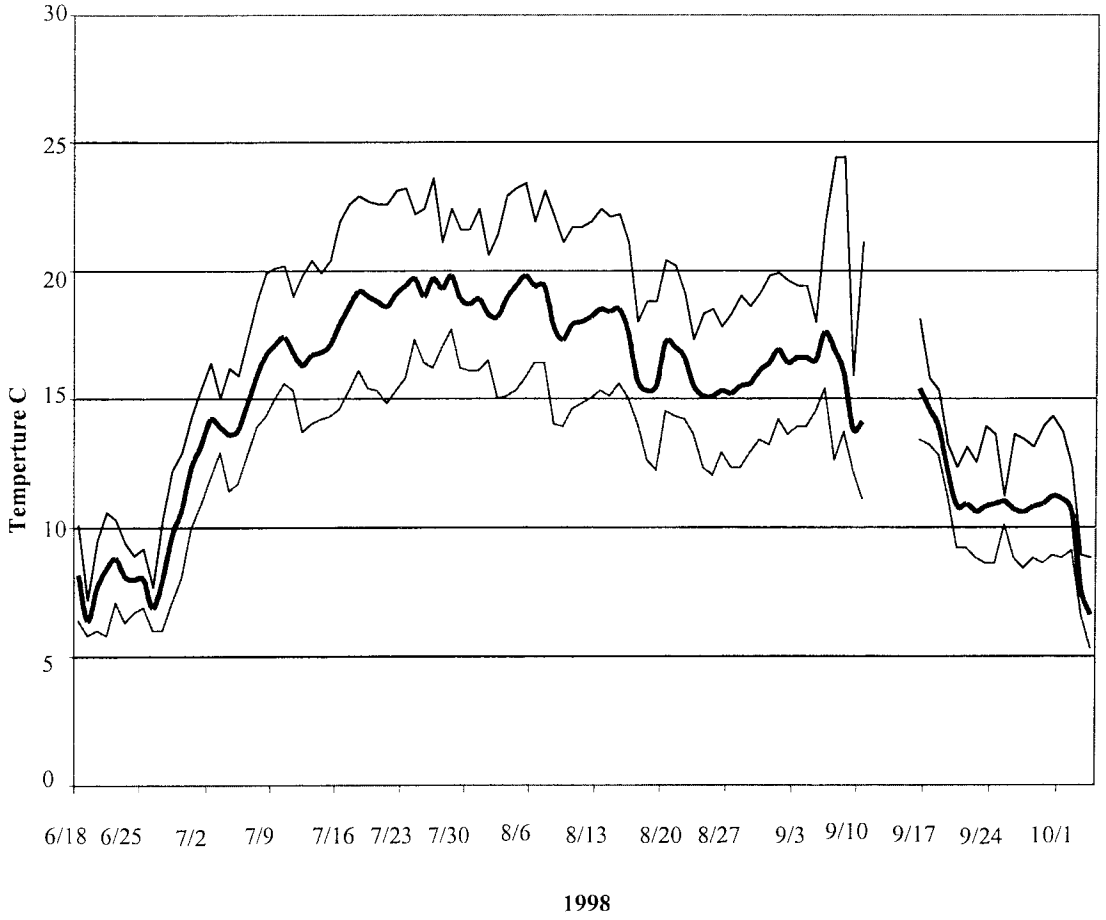

Figure 15. Mean, maximum, and minimum daily water temperatures in the upper North Fork Payette River, at the USGS gauge below Fisher Creek, 1998.

Table 5. Electrofishing survey of the upper North Fork Gold Fork River in unnamed tributary. Sites correspond to map locations on Figure 10.

Site	Site Description	Start location (UTM 11T NAD 27)		End location (UTM 11T NAD27)		°C	Bull trout		Rainbow trout	
		North	East	North	East		Number sampled	Length range (mm)	Number sampled	Length range (mm)
A	FS402 crossing upstream to tributary 3	4950660	593300	4950840	593540	8.5	2	179-182	8	132-216
I	mouth of tributary 3	4950810	593540	4950650	593600		1	123	7	119-203
J	old trail crossing	4950530	593620	4950308	593750	11.0	12	106-194	0	
K	upper flats	4949700	593800	4949600	593800	11.0	7	86-150	0	

Table 6. Snorkel sample from upper North Fork Gold Fork River and tributaries, July 21, 1998. Sites correspond to map locations on Figure 10.

Site	Area Sampled (m^2)	GPS Location (UTM 11T NAD27)		Bull Trout		Rainbow Trout	
		North	East	Fish/ 100 m^2	Length Range (mm)	Fish/ 100m^2	Length Range (mm)
A	233	4950660	593300	2.146	150-200	0.000	--
B	379	4950850	593530	0.528	150-200	0.000	--
C	340	4951240	594054	1.176	180-200	0.588	200-255
D	287	4951572	594299	0.000	--	0.348	175
E1	393[a]	4952120	594980	0.000	--	0.000	--
E9		4954500	595920				
F	155	4951560	593900	0.000	--	0.065	100
G	162	4952800	594060	0.000	--	0.000	--
H	109	4954320	594180	0	--	0.000	--

Table 7. Physical characteristics for snorkel surveys, North Fork Gold Fork River, July 21, 1998. Sites correspond to map locations on Figure 10.

Site	°C	Visibility (m)	Mean stream width (m)	Percent of habitat types			
				Pool	Riffle	Run	Pocket water
A	8.0	6.6	5.73	20	40	0	40
B	8.0	--	5.65	10	60	0	30
C	9.0	6.6	4.72	10	45	0	45
D	9.5	6.4	6.92	40	30	0	30
E[a]	10-12	good	2.56	45	32	10	13
F	7.5	6.0	3.63	40	60	0	0
G	8.5	4.5	3.23	30	70	0	0
H	11.0	5.0	2.35	60	40	0	0

[a] Sum of several small sites sampled throughout reach.

Table 8. Snorkel survey of North Fork Kennally Creek and tributaries, July 22-24, 1998, to determine presence of bull trout. Sites correspond to map locations on Figure 11.

Site	Area sampled (m^2)	GPS location (UTM 11T NAD 27)		Redband trout		Brook trout		Cutthroat trout	
		North	East	Fish/ $100m^2$	Length range (mm)	Fish/ $100m^2$	Length range (mm)	Fish/ $100m^2$	Length range (mm)
1	282	4965638	591125	0	--	7.44	75-255	0.00	--
2	1,097	4961372	590041	0	--	7.11	50-205	0.00	--
3	--	4964190	591840	0	--	0.00	50-300	0.00	--
4	188	4964270	591900	0	--	6.42	50-155	0.00	--
5	242	4964860	591880	0	--	0.00	--	0.00	--
6	763	4965520	589400	0	--	1.10	75-205	0.26	155-205
7	--	4965000	590120	0	--	0.00	--	0.00	--
8	--	4965450	589100	0	--	0.00	--	0.00	155-300
9	--	4965465	588900	--	115-205	0.00	--	0.00	50-300

Table 9. Physical characteristics for snorkel survey, North Fork Kennally Creek and tributaries, July 22-24, 1998. Sites correspond to map locations on Figure 11.

Site	°C	Visibility (m)	Mean stream width (m)	Percent of habitat types			
				Pool	Riffle	Run	Pocket water
1	14	--	3.62	30	70	0	0
2	12	5	10.52	--	--	--	--
3	12	>3	--	80	20	0	0
4	13	>3	2.5	15	60	0	25
5	10	>3	2.2	20	80	0	0
6	13	>3	5.53	20	50	0	30
7	--	--	--	--	--	--	--
8	13	>3	--	75	25	0	0
9	10	>3	--	45	10	0	45

Table 10. Fish caught and released during guided angling trips with Wapiti Meadows Ranch Outfitters on the South Fork Salmon River downriver from the East Fork South Fork Salmon River, 1998. Average catch rate was 1.8 fish/h. Total hours fished was 55.5.

Fish length (inches)	Number of fish caught and released				
	Steelhead/ redband trout	Westslope cutthroat trout	Mountain whitefish	Brook trout	Chinook salmon
3	4				
4	4				
5	5	4			
6	8	3			1
7	7				
8	9	2			
9	8	4			
10	11	5			
11	3	3			
12	2	2			
13		4			
14	2	2			
15	1	1			
16	2				
17	1				
18	1				
Totals	68	30			1

DISCUSSION

Temperature Monitoring on Upper Little Salmon River Drainage and North Fork Payette River

Summer river temperatures in the upper Little Salmon River drainage were comparable to those recorded in 1994, 1995 and 1996 (Janssen et al. 1995, 1997, 1999) with an exception in July 1998 when temperatures were slightly higher. Temperatures exceeded 20°C for more than six hours almost daily from early July through early September. A consistent pattern continued to develop regarding the difference in temperatures between Station 1 and Station 2. In 1998, Station 2 continued to be the cooler of the two stations, probably due to the local effect from Goose Creek inflow. Stations 1 and 2 are appropriate sites to continue monitoring because recorders remain shaded and in flowing water throughout the season. The Bureau of Land Management maintains temperature recorders in the river from Round Valley to the confluence with the main Salmon River (Craig Johnson, personal communication). No additional sites should be needed to characterize river temperatures throughout the mainstream of the Little Salmon River. Summer temperature monitoring will continue indefinitely to identify trends with weather, flow regime, and recovery of the riparian community.

Mud Creek is a headwater tributary to the Little Salmon River. The temperature recorder is located within a riparian enclosure on land owned by Boise Cascade Corporation. Average daily temperatures were consistently higher in 1998 than during 1996 (Janssen et al. 1997). This station will be monitored annually indefinitely to identify trends in stream temperatures with varying weather, and recovery of the riparian community.

Average daily temperature in the North Fork Payette River did not exceed 20°C, although from mid-June through mid-August, 20°C was exceeded daily for more than six hours. We will continue to monitor summer river temperatures until data are collected over an adequate range of weather and water conditions.

Survey of Gold Fork River Drainage

Throughout our survey of the Gold Fork River drainage we observed temperatures noticeably higher in lake origin streams vs. spring origin streams. Bull trout were found in the spring fed tributary to the upper North Fork Gold Fork River, though only redband trout were found in a nearby lake origin tributary with comparable habitat and gradient. The absence of fish from the headwaters of the North Fork Gold Fork was perplexing. A more thorough survey should be conducted in this reach prior to land or fish management activities.

As previously documented, brook trout are the most abundant species in the North Fork Kennally Creek (USFS files; Anderson and Robertson 1985). No bull trout were documented during the survey. The observation of 53 juvenile and adult cutthroat trout in the outlet tributary from Kennally Lakes was not expected. Cutthroat trout fry were routinely stocked in the Kennally lakes during the early 1970s. In 1980, 576 rainbow x cutthroat trout hybrid fry were stocked; and in 1989, 500 westslope cutthroat trout fry were stocked. No cutthroat trout have been stocked since 1989.

Abundant brook trout and fewer redband trout were observed during reconnaissance of Rapid Creek. We decided the stream was adequately sampled for presence of bull trout and did not return to conduct quantitative surveys.

South Fork Salmon River Guided Fishery

Angler catch rates were lower in 1998 (1.89 fish/h) than reported in 1997 (2.1 fish/h) and 1994 (2.3 fish/h), but were higher than 1995 (1.2 fish/h). We will continue to collect this angler information as long as the outfitter continues guiding in this reach of the South Fork Salmon River.

RECOMMENDATIONS

1. Continue kokanee spawner counts in the North Fork Payette River to monitor Payette Lake kokanee stocks and to help calibrate kokanee trawling work.

2. Protect Indian Creek drainage as it contains a small, viable bull trout population.

3. Discontinue stocking of the Colorado River strain of rainbow trout in Kennally Creek and Gold Fork River.

4. Collect habitat data on Gold Fork River and Kennally Creek to help explain extremely low numbers of trout present.

5. Continue conducting stream surveys on streams where no data exists or where data is older than five years.

6. We should continue to monitor summer river temperatures in the upper Little Salmon River and the North Fork Payette River on an annual basis. This will create a long-term database to evaluate changes in river temperatures with recovery of the riparian community and changes in stream discharge.

7. A consolidation of stream survey data among agencies would aid in focusing future work in areas of unknown fish distribution.

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APPENDICES

Appendix A. Daily mean, minimum, and maximum stream temperatures C, in the upper Little Salmon River drainage, 1998.

	Mud Creek			Little Salmon River Station 1			Little Salmon River Station 2		
DATE	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN
06/18/98				16.5	20.9	12.5	13.1	16.5	10.1
06/19/98				13.6	17.4	10.9	11.3	12.5	9.7
06/20/98				14.3	19	10.2	12	14.6	9.2
06/21/98				15.8	21.3	10.9	13.2	17	9.7
06/22/98				15.9	20.1	11.7	13.5	17.5	10.5
06/23/98				16.3	20.5	12.5	13.8	16.5	11.1
06/24/98	13	14.4	10.9	14.6	17.4	12.5	12.7	13.6	11.2
06/25/98	12.6	14.4	11.3	14.4	17.1	12.5	12.3	13.9	10.9
06/26/98	10.4	11.3	9.4	12.1	14.1	10.2	10.7	11.5	9.7
06/27/98	11.1	15.9	7.4	12.7	18.6	8.2	11.4	15.6	8.1
06/28/98	12.5	17.4	8.2	14.6	20.1	9.4	13.2	17	9.4
06/29/98	14.1	19	9.8	16.3	21.7	11.3	14.7	18.8	10.9
06/30/98	15.2	20.1	10.9	17.4	22.4	12.5	16	20.1	12.2
07/01/98	16.6	20.9	12.9	18.5	23.2	14.1	17	20.4	13.7
07/02/98	16.5	20.9	12.5	18.6	22.8	14.4	17.2	20.4	13.9
07/03/98	15.2	17.1	14.4	16.7	19.4	15.6	16.1	17.5	15.1
07/04/98	15.7	20.9	11.3	17.3	22.8	12.9	16.7	20.9	13.1
07/05/98	16.6	19.8	13.7	18.2	22.4	14.4	17.5	20.2	14.5
07/06/98	17.1	22.1	12.9	19.1	24.4	14.4	18.3	22.4	14.3
07/07/98	18	22.4	13.7	20.2	24.8	15.6	19.7	23.4	15.9
07/08/98	18.7	23.2	14.4	20.9	25.2	16.3	20.4	23.7	16.9
07/09/98	19.2	22.8	15.2	21.4	25.6	17.1	21	24.4	17.5
07/10/98	19.1	22.4	15.6	21.8	24.4	18.6	21.1	24.6	18
07/11/98	19	22.8	15.6	20.6	22.8	17.8	20.5	22.9	18
07/12/98	18.5	22.8	14.1	20	24	15.9	20.1	23.9	16.7
07/13/98	18.7	23.2	14.4	21	24.8	17.4	20.9	25	17.3
07/14/98	18.9	23.2	14.8	21.5	24.8	17.8	21	24.8	17.3
07/15/98	19.2	24	14.8	21.8	25.6	18.2	21.3	25.3	17.3
07/16/98	19.9	24.8	15.6	22.5	26.3	18.6	21.7	26.2	17.3
07/17/98	20.5	25.6	15.9	23.3	27.5	19.4	22.3	27	17.7
07/18/98	21.8	26.3	17.8	24.5	27.9	21.3	23.3	27.2	19.6
07/19/98	21.1	25.6	16.7	23.5	26.7	19.8	22.3	26.3	18.3
07/20/98	20.8	25.6	16.3	23.1	26.7	19.4	21.9	25.8	17.8
07/21/98	20.3	25.2	15.6	22.7	26.3	19	21.3	25.3	17.2
07/22/98	20.3	25.6	15.6	22.5	25.9	19	21.2	25.3	17
07/23/98	20.2	24.4	15.9	22.3	24.8	19.4	21.1	24.4	17.5
07/24/98	21.2	24.8	18.2	22.9	26.3	20.1	22.1	26	19

Appendix A. Continued

	Mud Creek			Little Salmon River Station 1			Little Salmon River Station 2		
DATE	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN
07/25/98	20.8	25.2	16.7	23	26.3	19.8	22.2	25.6	18.5
07/26/98	21.9	26.3	17.8	23.8	27.1	20.5	23	26.7	19.3
07/27/98	21.4	24.4	17.8	23.3	25.2	20.9	22.4	24.4	19.6
07/28/98	22	25.9	18.6	23.6	26.3	20.5	22.6	25.5	19.3
07/29/98	21.4	25.6	17.8	23.1	25.6	20.5	22.4	25.6	19.1
07/30/98	20.8	25.6	17.4	22	24.4	19.4	21.3	24.3	18.5
07/31/98	20.8	24.4	17.4	21.7	24	19.4	21.1	24.4	18.1
08/01/98	19.9	21.7	18.2	21.1	22.4	19.4	20.4	22.1	18.3
08/02/98	19	23.2	15.2	20.6	24	17.4	20.6	24.6	17
08/03/98	19.8	25.2	14.8	21.4	25.2	17.8	21.1	25.6	17
08/04/98	20.6	25.9	15.6	22.1	25.6	18.6	21.8	26.2	17.5
08/05/98	21.3	25.9	16.7	22.6	25.2	19.4	22.3	26	18.3
08/06/98	21.3	25.6	17.4	21.8	24	19.4	21.8	24.3	19
08/07/98	20.9	24.8	17.4	21.8	24.8	19	21.6	24.8	18.6
08/08/98	19.3	24.8	14.4	20.2	23.6	16.7	20.5	24.3	16.5
08/09/98	19.2	24.8	14.1	20.3	23.6	16.7	20.4	24.3	16.4
08/10/98	20.2	25.6	15.6	20.9	24	17.4	21	24.8	17
08/11/98	19.5	23.6	15.6	20.8	22.8	18.2	20.4	22.7	17.2
08/12/98	19.8	25.6	14.8	20.6	24	17.4	20.1	23.9	16.2
08/13/98	20.5	25.9	15.6	21.5	25.2	17.8	21	24.4	17.3
08/14/98	20.5	25.2	15.9	21.6	24	18.6	21.4	24.4	17.8
08/15/98	20.3	24.4	16.3	21.1	24	17.8	21.3	24.4	17.8
08/16/98	19.7	24	15.9	20.2	22.4	17.1	20.2	23.2	17.2
08/17/98	17.7	22.1	14.1	18.1	20.9	15.2	18.5	21.4	15.4
08/18/98	17.1	22.1	12.5	17.7	20.9	14.4	18.2	22.1	14.3
08/19/98	16.8	22.1	11.7	17.3	20.9	13.7	17.9	22.1	14
08/20/98	18.2	23.6	14.1	18.7	22.1	15.6	18.9	22.9	15.1
08/21/98	18.5	23.2	14.1	18.7	21.3	15.6	19.2	22.7	15.4
08/22/98	18.2	23.2	14.1	18.1	20.1	15.6	18.7	22.2	15.1
08/23/98	16.7	20.9	12.9	17.1	19.4	14.8	17.3	19.1	14.8
08/24/98	16.3	21.3	12.1	16.2	19.4	12.9	16.8	20.6	13.6
08/25/98	15.9	21.3	10.9	16.5	19.4	13.3	16.7	20.4	12.8
08/26/98	16.6	20.9	12.5	17.1	19.4	14.8	17.3	20.4	14
08/27/98	16.4	21.7	11.7	16.9	19.8	14.1	17.1	20.7	13.2
08/28/98	16.7	22.4	11.7	17.4	20.5	14.1	17.6	21.7	13.4
08/29/98	17	22.4	12.5	17.6	19.8	14.8	17.7	20.9	14.3
08/30/98	17.1	21.3	13.3	17.8	20.5	14.8	17.8	20.9	14.3
08/31/98	17.3	23.2	12.5	17.8	20.9	14.4	17.9	21.9	14
09/01/98	17.8	22.8	13.3	18.4	21.3	15.2	18.5	22.1	14.8

Appendix A. Continued.

	Mud Creek			Little Salmon River Station 1			Little Salmon River Station 2		
DATE	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN
09/02/98	17.9	23.2	13.3	18.3	21.7	14.8	18.6	22.2	14.8
09/03/98	17.9	23.2	13.3	18.4	21.7	14.8	18.8	22.4	15.1
09/04/98	17.9	23.2	13.3	18.4	21.7	14.8	18.7	22.4	15
09/05/98	16.4	18.2	14.1	17.3	20.1	15.2	17.5	19.4	15.8
09/06/98	17.9	22.1	14.4	18.3	21.3	15.6	18.6	22.1	15.8
09/07/98	19.1	23.2	16.3	19.3	21.3	17.4	19.6	22.1	17.7
09/08/98	19.5	22.1	17.4	18.8	20.1	17.4	19.3	20.9	18
09/09/98	16.5	18.2	15.2	16.4	17.8	15.6	16.7	18.1	16.1
09/10/98	16.2	19.8	14.1	17	20.1	14.8	17.1	19.6	15.3
09/11/98	16.4	20.5	12.9	16.5	19.4	13.7	17	19.8	14.5
09/12/98	16.7	20.9	13.3	16.8	19.8	14.1	17.2	20.1	14.6
09/13/98	15.8	20.5	12.1	15.9	19	12.9	16.6	19.9	13.6
09/14/98	15.9	20.5	12.1	16.2	19.4	12.9	16.9	20.1	13.9
09/15/98	15.9	20.9	11.7	16.4	19.4	13.3	17	20.2	13.9
09/16/98	16.9	21.3	13.7	17.3	20.1	14.4	17.8	20.9	15.1
09/17/98	16.5	20.5	13.3	16.9	19	14.4	17.1	19.6	14.8
09/18/98	15.3	17.1	13.3	15.6	17.4	14.4	16	17.2	14.6
09/19/98	13.4	14.4	12.1	13.7	14.8	12.5	14.2	15.1	13.1
09/20/98	12.5	15.9	9.8	13.2	15.2	11.3	13.9	16.5	12.2
09/21/98	12.7	17.1	9.4	13.2	15.9	10.6	13.9	17.2	11.2
09/22/98	12.1	15.9	9	12.9	14.8	10.6	13.7	16.5	11.1
09/23/98	11.5	15.6	8.2	12.9	15.6	10.2	13.7	17.2	10.8
09/24/98	11.9	16.3	8.2	12.9	15.2	10.2	13.8	16.9	10.8
09/25/98	12.2	13.3	11.7	13.2	14.4	12.5	13.5	14.6	12.8
09/26/98	11.8	15.2	9	12.4	15.2	9.8	12.8	15.4	10.5
09/27/98	12.1	16.3	8.6	13	15.6	10.2	13.6	16.9	11.1
09/28/98	11.9	15.6	8.6	13.5	15.9	10.9	13.9	16.5	11.5
09/29/98	12.1	16.3	8.6	13.4	15.6	10.9	14	17	11.7
09/30/98	12.2	16.3	8.6	13.2	15.2	10.6	13.7	16.7	10.9
10/01/98	11.4	14.4	8.6	12.4	14.1	10.2	13	15.1	10.9
10/02/98	11.4	12.9	10.2	13	14.4	11.7	13	14.8	11.9
10/03/98	8.7	10.9	6.6	10	12.1	8.6	10.9	12.3	9.8
10/04/98	7.2	10.2	5.3	8.5	10.2	6.6	9.3	11.7	7.5

Appendix B. Daily mean, minimum, and maximum stream temperatures in the upper North Fork Payette River, 1998.

Date	Mean	MAX	MIN
06/18/98	8.2	10.1	6.4
06/19/98	6.4	7.2	5.8
06/20/98	7.7	9.5	6
06/21/98	8.4	10.6	5.8
06/22/98	8.8	10.3	7.1
06/23/98	8.1	9.4	6.3
06/24/98	8	8.9	6.7
06/25/98	8	9.2	6.9
06/26/98	6.9	7.7	6
06/27/98	8	10.3	6
06/28/98	9.7	12.2	7.1
06/29/98	10.7	12.9	8.1
06/30/98	12.3	14.3	10
07/01/98	13.2	15.4	10.9
07/02/98	14.2	16.4	11.9
07/03/98	13.9	15	12.9
07/04/98	13.6	16.2	11.4
07/05/98	13.8	15.9	11.7
07/06/98	14.8	17.3	12.8
07/07/98	15.9	18.8	13.9
07/08/98	16.7	19.9	14.3
07/09/98	17.1	20.1	15
07/10/98	17.4	20.2	15.6
07/11/98	16.8	19	15.3
07/12/98	16.3	19.8	13.7
07/13/98	16.7	20.4	14
07/14/98	16.8	19.9	14.2
07/15/98	17.1	20.4	14.3
07/16/98	17.9	21.9	14.6
07/17/98	18.6	22.6	15.3
07/18/98	19.2	22.9	16.1
07/19/98	19	22.7	15.4
07/20/98	18.8	22.6	15.3
07/21/98	18.6	22.6	14.8
07/22/98	19.1	23.1	15.3
07/23/98	19.4	23.2	15.8
07/24/98	19.7	22.2	17.3
07/25/98	19	22.4	16.4

Appendix B. Continued.

Date	Mean	MAX	MIN
07/26/98	19.7	23.6	16.2
07/27/98	19.3	21.1	17
07/28/98	19.8	22.4	17.7
07/29/98	18.9	21.6	16.2
07/30/98	18.7	21.6	16.1
07/31/98	18.9	22.4	16.1
08/01/98	18.3	20.6	16.5
08/02/98	18.2	21.4	15
08/03/98	18.9	22.9	15.1
08/04/98	19.4	23.2	15.3
08/05/98	19.8	23.4	15.8
08/06/98	19.4	21.9	16.4
08/07/98	19.4	23.1	16.4
08/08/98	17.8	22.1	14
08/09/98	17.3	21.1	13.9
08/10/98	17.9	21.7	14.6
08/11/98	18	21.7	14.8
08/12/98	18.2	21.9	15
08/13/98	18.5	22.4	15.3
08/14/98	18.4	22.1	15.1
08/15/98	18.5	22.2	15.6
08/16/98	17.6	21.1	15
08/17/98	15.7	18	14
08/18/98	15.3	18.8	12.6
08/19/98	15.5	18.8	12.2
08/20/98	17.2	20.4	14.5
08/21/98	17	20.2	14.3
08/22/98	16.6	19.1	14.2
08/23/98	15.5	17.3	13.6
08/24/98	15.1	18.3	12.3
08/25/98	15.1	18.5	12
08/26/98	15.3	17.8	12.9
08/27/98	15.2	18.3	12.3
08/28/98	15.5	19	12.3
08/29/98	15.6	18.6	12.9
08/30/98	16.1	19.1	13.4
08/31/98	16.4	19.8	13.2
09/01/98	16.9	19.9	14.2
09/02/98	16.4	19.6	13.6

Appendix B. Continued.

Date	Mean	MAX	MIN
09/03/98	16.6	19.4	13.9
09/04/98	16.6	19.4	13.9
09/05/98	16.5	18	14.5
09/06/98	17.6	21.9	15.4
09/07/98	16.9	24.4	12.6
09/08/98	16	24.4	13.7
09/09/98	13.8	15.9	12.2
09/10/98	14.1	21.1	11.1
09/11/98			
09/12/98			
09/13/98			
09/14/98			
09/15/98			
09/16/98	15.4	18.1	13.4
09/17/98	14.6	15.8	13.2
09/18/98	13.9	15.3	12.8
09/19/98	12.2	13.2	11.2
09/20/98	10.8	12.3	9.2
09/21/98	10.9	13.1	9.2
09/22/98	10.6	12.5	8.8
09/23/98	10.8	13.9	8.6
09/24/98	10.9	13.6	8.6
09/25/98	11	11.2	10.1
09/26/98	10.7	13.6	8.8
09/27/98	10.6	13.4	8.4
09/28/98	10.8	13.1	8.8
09/29/98	10.9	13.9	8.6
09/30/98	11.2	14.3	8.9
10/01/98	11.1	13.7	8.8
10/02/98	10.6	12.3	9.1
10/03/98	7.6	8.9	6.6
10/04/98	6.6	8.8	5.3

1998 ANNUAL PERFORMANCE REPORT

State of : Idaho

Program: Fisheries Management

Project I: Surveys and Inventories

Subproject: Southwest Region (McCall

Job: d

Title: Salmon and Steelhead Investigations

Contract Period: July 1, 1998 to June 30, 1999

ABSTRACT

McCall Subregion salmon and steelhead investigations are incorporated into separate statewide reports. These reports include: "Salmon and Steelhead Investigations," "Salmon Spawning Ground Surveys," "Idaho Supplementation Studies," and "Idaho Habitat/Natural Production Monitoring."

Authors:

Don Anderson
Regional Fishery Manager

1998 ANNUAL PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management

Project II: Technical Guidance

Subproject: Southwest Region (McCall)

Contract Period: July 1, 1998 to June 30, 1999

ABSTRACT

McCall Subregion fishery management personnel responded to more than 300 requests and opportunities for technical input. Comments were provided to state and federal agencies on proposed activities for which they have regulatory authority. Advice and technical assistance were provided to private businesses and the public on activities associated with fish, or having impacts on fish populations or fish habitat. The major topics of involvement included stream channel alterations, Idaho Outfitters and Guides licensing, private pond permits, and land management planning. We provided data and technical advice to an increased number of fisheries consultants.

Staff also gave presentations to schools, sportsperson groups, and civic organizations. We answered many questions from the angling public on fishing opportunities, regulations, techniques, and specific waters.

Author:

Donald Anderson
Regional Fishery Manager

1998 ANNUAL PERFORMANCE REPORT

State of: Idaho | Program: Fisheries Management

Project III: Habitat Management | Subproject: Southwest Region (McCall)

Contract Period: July 1, 1998 to June 30, 1999

ABSTRACT

The Regional Fishery Manager participated on a technical advisory committee for the Big Payette Lake Water Quality Council. The group conducted studies and developed a comprehensive technical report that identified nutrient and bacterial contamination sources and recommended remedial action. The technical report resulted in a lake management plan and an implementation program, which were both passed into legislation in the 1998 session.

Fishery personnel participated on a technical advisory committee for the Cascade Restoration Project to improve water quality and fish habitat in Cascade Reservoir. Idaho Division of Environmental Quality listed Cascade Reservoir as a water quality limited water not fully supporting beneficial uses including cold water biota. The technical advisory committee was directed to identify phosphorus sources and develop reduction measures. A Total Maximum Daily Load (TMDL) has been established that will result in a 37% reduction in phosphorus loading. Source plans were prepared and an implementation plan is being drafted.

A conservation easement was obtained on 100 acres of private property in Burgdorf Meadows. This is a critical spawning area for wild summer chinook salmon *Oncorhynchus tshawytscha* and was imminently at risk of recreation home development. We prepared a proposal and sought funding to allow Idaho Department of Fish and Game and Nez Perce Tribe to acquire the easement.

Fisheries personnel identified a need for screening juvenile and adult rainbow trout *Oncorhynchus mykiss* out of Mahala Ditch on Lake Fork, a tributary to Cascade Reservoir. A low-tech, flat screen and a fishway were designed and constructed into the new diversion structure at Mahala ditch. Various state and federal agencies jointly funded this by cost-sharing with the irrigators.

A minimum stream resource maintenance flow in the North Fork Payette River above Payette Lake was modeled and recommended for adoption by the Idaho Legislature. The flow was chosen to encourage adult kokanee salmon *Oncorhynchus nerka kennerlyi* to choose redd locations that will not be dewatered during egg incubation.

Author:

Donald Anderson
Regional Fishery Manager

Submitted by:

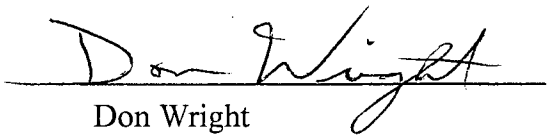
Don Anderson
Regional Fishery Manager

Paul Janssen
Regional Fishery Biologist

Kim Apperson
Regional Fishery Biologist

Lauri Hostettler
Fisheries Biologist Aide

Approved by:



Don Wright
Regional Supervisor